

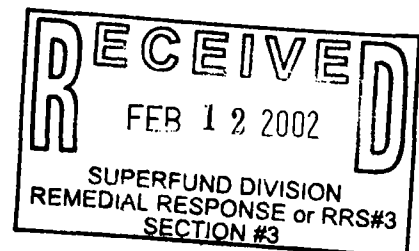
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**Allied Paper, Inc./Portage Creek/
Kalamazoo River Superfund Site Remedial
Investigation/Feasibility Study**

***Final Technical Memorandum 14
Biota Investigation***

Allied Paper, Inc./Portage Creek/
Kalamazoo River Superfund Site
Kalamazoo, Michigan

January 2002



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Section One

Section 1

Introduction

This document is Final. It is a revised version of a draft Technical Memorandum that was submitted to the MDEQ pursuant to Administrative Order by Consent No. DFO-ERD-91-001. The MDEQ has modified and finalized the Technical Memorandum pursuant to paragraph 30(d) of the Administrative Order by Consent.

1.1 Kalamazoo River Description

The Kalamazoo River is located in southwestern Michigan (Figure 1). The main stem of the Kalamazoo River begins in Albion, Michigan, at the confluence of the north and south branches, and flows northwesterly for 123 miles through Kalamazoo and Allegan Counties to Lake Michigan. The Kalamazoo River drains about 2,000 square miles and is fed by more than 400 miles of tributaries.

The Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site (Site) includes approximately 80 miles of the Kalamazoo River and the lower three miles of Portage Creek, a tributary that joins the Kalamazoo River at Kalamazoo, Michigan. The biota investigation was conducted along portions of approximately 100 miles of the river between Battle Creek, Michigan, and the river's mouth near Saugatuck, Michigan. A more extensive review of the physical setting and characteristics of the Site is contained in the Description of the Current Situation (DCS) report (Blasland & Bouck, 1992).

1.2 Kalamazoo River Biota Investigation Background

The presence of polychlorinated biphenyls (PCB) in the Kalamazoo River has been the subject of a number of studies since 1971. The studies conducted from 1971 until 1992 have been documented in the DCS report. However, the information contained in the previous studies was insufficient to characterize the levels of PCB currently present in biota in various sections of the river. As a result, a Biota Sampling Plan (BSP) was prepared by Camp Dresser & McKee, Inc. (CDM) (CDM, 1993). In 1993 and 1994, sampling tasks prescribed by the BSP were carried out by Blasland, Bouck & Lee (BBL) personnel on behalf of the Kalamazoo River Study Group as directed by Michigan Department of Environmental Quality (MDEQ) formerly the Michigan Department of Natural Resources (MDNR). In 1997, additional sampling was performed by BBL according to the scope of work approved by MDEQ. This additional sampling, although not supported by MDEQ, was conducted to obtain fish tissue PCB data in 1997 that could be compared to the fish tissue data obtained in 1993.

1.3 Objectives of the Biota Investigation

The Remedial Investigation/Feasibility Study (RI/FS) was designed to assess the nature and extent of PCB contamination, and to determine the potential risks to public health and the environment. The biota sampling portion of the RI was designed to provide data to support the HHRA and BERA that have been prepared by the MDEQ for the Site. The biota investigation will provide tissue concentration data for selected aquatic and terrestrial species to support the

development of the site-specific food web model and the HHRA model. The HHRA and BERA will be used to develop PCB cleanup criteria for surface water, sediment, and soil concentrations that would be protective of biota and human health.

The biota investigation comprises two major efforts: an aquatic biota investigation and a terrestrial biota investigation.

1.3.1 Objectives of the Aquatic Biota Investigation

The aquatic biota investigation is designed to determine concentrations of PCB, mercury, select constituents from the MDNR Fish Contaminant Monitoring Program Constituent List (pesticides), and polychlorinated dibenzodioxins/polychlorinated dibenzofurans (PCDD/PCDF) in resident aquatic species of the Kalamazoo River. Smallmouth bass, carp, white suckers, and snapping turtles were selected as the target aquatic species. The food web model presented in the BSP identified these fish species as representatives of game fish (smallmouth bass), rough fish (carp), and forage fish (suckers). Smallmouth bass were selected because they are popular game fish species. Carp are one of the most abundant and widespread food fish species in the Kalamazoo River drainage basin. White suckers represent forage fish, which are available for consumption by piscivorous predators (e.g. mink). Data will be used to estimate exposure of identified consumer species (both humans and higher trophic level biota) that use these species as food sources. PCB residue data for fish will also be used to develop a database from which trends in the bioavailability of PCB can be measured over time.

An additional objective of the aquatic biota investigation was to assess the relationships between PCB concentrations and lipid content in fillet and whole-body samples of fish. These relationships can be used to predict the whole-body PCB concentration of a fish sample based on known fillet PCB concentration and lipid content of fillet and remaining-carcass samples of that fish. A pilot study to determine the strength of the relationship between PCB concentration and lipid content will be conducted.

1.3.2 Objectives of the Terrestrial Biota Investigation

The terrestrial biota investigation is designed to generate PCB data from selected species for use in the BERA and to estimate exposure of identified consumer species that use these species as food sources. Another objective of the terrestrial biota investigation is to provide data for the BERA for use in developing the relationship between soil PCB concentrations and biota PCB concentrations.

Accordingly, terrestrial biota samples will be collected in five Terrestrial Biota Sampling Areas (TBSAs) representative of specific ranges of soil PCB concentrations determined using field screening methods developed in Phase I and verified in Phase II TBSA soil sampling. TBSA 1 was selected to represent the lower PCB range of soil concentrations based on screening results from non-detect to 10 milligram per kilogram (mg/kg). TBSA 10 represents the 10 to 25 mg/kg PCB in soil screening range. TBSA 3 represents the 25 to 50 mg/kg PCB in soil screening range, and TBSA 5 represents the 50 to 100 mg/kg PCB in soil screening range. TBSA 11 was selected as the reference location because PCB were not detected in the soil samples collected during the Phase I TBSA field screening sampling.

White-footed mice and earthworms were designated as target terrestrial species based on their ecological significance and occurrence. Red fox, mink, and great horned owl were identified as consumers of white-footed mice, and robins as consumers of earthworms.

1.4 Scope of the Technical Memorandum

This document includes the presentation of results for sampling efforts conducted as part of the biota investigation, excluding the mink and muskrat sampling results. Also presented are descriptions of field activities, field data, analytical data, and results of the quality assurance/quality control (QA/QC) review of the analytical data.

Refer to Technical Memorandum 11 - Allied Paper, Inc. Operable Unit Biota and Surface Water Investigations and Wetlands Assessment (BBL, 2000a) for presentation of activities, results and findings of the fish collected at the Allied Paper, Inc., Operable Unit.

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Section Two

Section 2

Investigation Activities

2.1 Overview

2.1.1 Aquatic Biota Investigation

Information on the nature and extent of PCB contamination in fish and turtles from the Site was based on two sampling events. Fish and turtles were collected in 1993 and 1994 under the BSP to support the BERA and HHRA; while fish only were collected in 1997 (BBL letter, October 13, 1997) to gather data to support future trend analysis. Fish and turtle collection activities during 1993, 1994 and 1997 were conducted by BBL with MDEQ oversight.

The 1993 fish sampling event focused on three fish species representative of game fish (smallmouth bass), rough fish (carp), and forage fish (suckers) collected from nine different locations within the Site, and two background locations. At each sampling location, eleven fish of each species were collected for PCB analyses. The 1993-1994 turtle samples were collected from four different locations within the Site, and one background location. Six turtle leg and neck muscle samples were collected for the HHRA from each sampling location, and five turtle whole body samples were collected from each sampling location for the BERA. Turtle samples were analyzed for PCB content.

The 1997 sampling event only focused on collecting game fish species (carp and smallmouth bass) from the Site. These fish were collected from four locations within the Site and one background area. PCB levels in fish tissue collected from 1997 will be used to assess PCB levels in fish over time. However, since only two years of MDEQ-approved fish sampling has been initiated at the Site since 1990, additional data will need to be collected over time to conduct trend analysis. The MDEQ has initiated a long term monitoring program that will monitor PCB levels in fish to evaluate the effectiveness of remedial alternatives selected for the Site. The MDEQ conducted fish sampling in late 1999, but the PCB data from that sampling event is not available as of August 2000.

Sample preparation methods for individual fish species and turtles were created to generate data sufficient to characterize PCB concentrations for both a fillet and whole-body basis. Based upon a pilot study (Appendix A) conducted by BBL, data indicate that whole-body fish PCB concentrations could be reliably estimated from measurements of PCB levels in fillets and measurements of lipids in fillets and in the remainder of the fish (carcass). Whole body fish PCB concentrations were used in the BERA, and fillet PCB concentrations were used in the HHRA.

2.1.2 Terrestrial Biota Investigation

In 1993 and 1994 terrestrial biota were collected from the Site by both BBL and MDEQ to support the BERA. BBL collected earthworms, small mammals, and co-located soil samples in 1993, while MDEQ collected mink and muskrat in late 1993 and early 1994. Biota samples were collected according to the BSP and MDEQ provided oversight for collection activities conducted by BBL.

To support the objectives of the BERA, tissue from small mammals included whole body for PCB analysis. The whole body sample represented the entire organism (including the pelage) minus the gut load. The gut-load was removed in order to determine the levels of PCB in tissue only. White-footed deer mice represented the small mammals in this study. Sample size for white-footed mouse was ten individuals from each TBSA.

Prior to PCB analysis, earthworms were depurated of digestive tract contents in order to determine the levels of PCB in tissue only. Sample size for each TBSA was 3 composites of 8 individuals, for a total of 24 individuals collected.

2.2 Sample Collection and Field Processing

2.2.1 Aquatic Biota

2.2.1.1 Fish

Sample collection efforts were completed as directed by the BSP. Fish sampling locations were selected to coincide with past MDNR sampling efforts. The BSP identified 11 Aquatic Biota Sampling Areas (ABSAs) for resident fish sampling from the Kalamazoo River. The ABSAs are:

- ABSA 1 - Kalamazoo River near I-94 upstream of the city of Battle Creek (reference area);
 - ABSA 2 - Morrow Lake;
 - ABSA 3 - Kalamazoo River downstream of Morrow Dam;
 - ABSA 4 - Kalamazoo River in the City of Kalamazoo near Mosel Avenue;
 - ABSA 5 - Kalamazoo River between the Highway 131 bridge in Plainwell and Plainwell Dam;
 - ABSA 6 - Kalamazoo River from Plainwell Dam to just upstream of Otsego City Dam;
 - ABSA 7 - Kalamazoo River just upstream of Otsego Dam;
 - ABSA 8 - Kalamazoo River just upstream of Trowbridge Dam;
 - ABSA 9 - Lake Allegan;
 - ABSA 10 - Kalamazoo River downstream of Allegan Dam; and
 - ABSA 11 - Kalamazoo River near Saugatuck
- ABSA locations are shown on Figures 1 through 9.

1993 Fish Sampling

Smallmouth bass (*Micropterus dolomieu*), carp (*Cyprinus carpio*), and white suckers (*Catostomus commersoni*) were the primary fish species targeted by the BSP for sampling in 1993. Sucker species include white suckers, golden redhorse suckers (*Moxostoma emthrurum*), northern hog

suckers (*Hypentelium nigricans*), and spotted suckers (*Minytrema melanops*). Walleye (*Stizostedion vitreum*) were initially targeted for collection at three locations: ABSA 1- Kalamazoo River near I-94 upstream of City of Battle Creek; ABSA 9 - Lake Allegan; and ABSA 10 - Kalamazoo River downstream of Allegan Dam. Initial collection efforts indicated limited availability of walleye at these sampling locations; therefore, smallmouth bass were collected as the representative game fish species. Similarly, in instances where sufficient numbers of white suckers were unavailable at a particular location, other available sucker species were substituted as appropriate and as directed by the MDEQ and CDM. In ABSAs 2, 4, 5, 6, and 7, the golden redbreast sucker was substituted for the white sucker. In ABSA 3, the northern hog sucker was substituted for the white sucker and in ABSA 10; the spotted sucker was substituted for the white sucker.

1997 Fish Sampling

The 1997 fish sampling collected smallmouth bass and carp from five of the eleven ABSAs sampled in 1993. These ABSAs included ABSA 1, ABSA 2, ABSA 5, ABSA 9, and ABSA 11 (Appendix H).

1993 and 1997 Fish Sampling Methods

For both 1993 and 1997 fish sampling episodes, eleven fish of each species was the desired sample size from each ABSA. Size requirements for the fish to be sampled were placed upon each species: smallmouth bass longer than 25 centimeters (cm); six carp between 45 and 55 cm and five carp longer than 58 cm; and suckers between 15 and 30 cm.

Fish were sampled using a boat-mounted electro fishing unit (Smith-Root Model SR-16 Electrofisher) following the procedures prescribed in Appendix A of the BSP.

Field processing of fish samples was completed at the BBL field office in Kalamazoo, Michigan. Prior to shipment to the laboratory, each fish was weighed and measured to determine live weight [in grams (g)] and length (in cm), and a scale sample was taken for age determination (only from the fish collected in 1993).

All fish were examined for external abnormalities, and observations were recorded on an appropriate Fish Condition Survey Form in the field notebook. Photographs of each individual fish were also taken.

Each fish was then wrapped in aluminum foil, placed in a sealed plastic bag, and preserved on ice. Samples were recorded on chain-of-custody forms and shipped to the laboratory via overnight courier. Field documentation (field data forms and fish condition survey forms), photographs, and chain-of-custody records are presented in Appendices B, C, and F, respectively.

2.2.1.2 Turtles

Snapping turtles (*Chelydra serpentina*) were sampled from three ABSAs:

- ABSA 1 - Kalamazoo River near I-94 upstream of Battle Creek;
- ABSA 5 - Kalamazoo River between the Highway 131 bridge in Plainwell and Plainwell Dam; and

- ABSA 10 - Kalamazoo River downstream of Allegan Dam.

Sample location ABSA 1 is considered the reference location because it is located upstream of the Site. Sample locations ABSA 5 and ABSA 10 are both located downstream, within the Site, in areas where PCB contamination is present in soils and sediment.

Eleven turtles were collected at each ABSA using baited traps. Turtles retained for analysis were required to have a carapace at least 20 cm in length. Turtle sampling was conducted from August 27 to October 10, 1993, and May 16 to 31, 1994, using trapping techniques and procedures described in the BSP.

Field processing of turtle samples was completed at the BBL field office. Prior to shipment to the laboratory, each turtle was weighed and measured to determine live weight and length. Gender was determined and recorded in the field notebook. Turtles were examined for external abnormalities and observations were recorded on an appropriate Turtle Condition Survey Form in the field notebook. Photographs of each turtle were also taken.

Turtles were sacrificed and shelled to obtain an appropriate sample. The turtles were processed individually in the field to obtain five whole-body samples (minus the shell) and six muscle-only (neck and leg muscle) samples for each sample location. Samples were then wrapped in aluminum foil, placed in a sealed plastic bag, and preserved on ice. Samples were recorded on chain-of-custody forms and shipped to the laboratory via overnight courier. Results of analyses performed on muscle-only samples will be used in the HHRA to evaluate risk to human consumers of turtles. Results of whole-body analyses are intended for evaluations of ecological risk.

Sample collection and processing was conducted according to Appendix A of the BSP. Samples were analyzed for PCB. PCDD/PCDF were analyzed in one muscle-only sample from each ABSA. Field documentation (field data forms and turtle condition survey forms), photographs, and chain-of-custody records are presented in Appendices B, C, F and I, respectively.

2.2.2 Terrestrial Biota

The BSP identified eleven preliminary TBSAs along the Kalamazoo River based on the availability of suitable habitat for small mammals and PCB concentrations in surface soils. Phase I TBSA screening was performed September 28 through October 1, 1993. All sampling activities and results are summarized in Technical Memorandum 2 (BBL, 1994, and BBL, 2000). Based on the results of Phase I screening, five TBSAs, each with a different range of PCB concentrations in soil, were selected for further, more intensive soil sampling. Listed below are the five TBSAs:

- TBSA 1 -Just upstream of the Swan Creek confluence with Kalamazoo River;
- TBSA 3 -Approximately 2 miles upstream of Trowbridge Dam;
- TBSA 5 -Approximately 2.25 miles upstream of the Schnable Creek confluence with Kalamazoo River;
- TBSA 10 -Behind Plainwell Wastewater Treatment facility along Kalamazoo River; and

- TBSA 11 - Approximately 2.25 miles upstream of I-94 bridge near Wattles Park (reference area).

The locations of TBSAs 1, 3, 5, 10, and 11 are shown in Figures 8, 10, 11, 12, 13, and 14, respectively.

Terrestrial biota sampling was conducted in these five TBSAs because they are representative of a variety of ranges of soil PCB concentrations based on Phase I TBSA soil screening. TBSA 1 was selected to represent the lower PCB range of soil concentrations from non-detect to 10 mg/kg. TBSA 10 represents the 10 to 25 mg/kg PCB in soil range. TBSA 3 represents the 25 to 50 mg/kg PCB in soil range and TBSA 5 represents the 50 to 100 mg/kg PCB in soil range. TBSA 11 was selected as the reference location because PCB were not detected in the soil samples collected during the Phase I TBSA soil sampling.

2.2.2.1 Soils

Phase II soil sampling was performed during November 10-12, 1993. In each TBSA, a 200 x 150 foot sampling grid was established and divided into five 40 x 150 foot strips. Eight surface soil borings were obtained from randomly selected locations within each strip. Samples were taken from the top one-foot of soil. Fifteen grams of soil from each boring were composited and homogenized to form a single composite sample representing each strip, resulting in five composite samples per TBSA. These samples were sent to the laboratory and analyzed for total PCB. No field screening was performed for this phase of the TBSA soil sampling. Results from these sampling events are described in the *Addendum to Technical Memorandum 2* (BBL, 2000).

2.2.2.2 Mice

White-footed deer mice (*Peromyscus leucopus*) trapping was conducted at the five TBSAs from September 29 to October 24, 1993. As directed by the BSP, a rectangular grid was established, and Sherman live traps set at 10-meter intervals. The initial sampling grids measured approximately 60 meters by 80 meters, and contained 48 traps each. To the extent possible, traps were placed in locations having indications of mouse activity (e.g., trails/runs, feces deposition), or in locations having attractive nesting habitat. Sampling grids were extended with additional traps if sufficient numbers of mice were not collected. Traps were baited with a mixture of oatmeal and peanut butter, and checked daily until a sample of ten adult mice was obtained. Adult mice were retained for PCB and lipid analysis and juvenile mice and non-target species were released.

Field processing of samples was performed in accordance with the BSP. Trapped mice were immediately sacrificed in the field by cervical dislocation. Each specimen retained for analysis was assigned a unique sample identification number and tagged on the right hind foot with an aluminum tag denoting the sample information. Information recorded in the field included specimen length and weight, sex, relative age (e.g., mature vs. immature), and the presence/absence of external anomalies. In addition, a photo was taken of each specimen (Appendix C).

Mouse tissue samples included the whole-body minus the gut load. The gut load was removed by incising the animal and removing the gastrointestinal tract. The gastrointestinal tract was opened and the contents removed, then the gastrointestinal tract was rinsed with distilled water and returned to the body cavity. Each sample was then wrapped in aluminum foil, placed in a

sealed plastic bag on dry ice, and shipped to the laboratory via overnight courier. Relevant sample information was recorded on a chain-of-custody form that was also shipped to the laboratory. Field documentation, including field data, Small Mammal Collection Field Data Sheets, photographs, and chain-of-custody forms are included in Appendices B, C, and F.

2.2.2.3 Earthworms

Three earthworm (*Lumbricus* sp.) samples were collected in each of the five TBSAs. Sample locations were within the small mammal trapping grids. Earthworms were collected by excavating the upper meter of soil with a shovel then sieving and handpicking the soil. The volume of excavated soil was recorded. Earthworms were collected until a composite sample of the laboratory-required 20 g was obtained.

During the field processing, earthworms were examined for external anomalies and taxonomic identification. Each composite sample of earthworms was rinsed in distilled water and placed in petri dishes containing moistened filter paper. Samples were stored in a cool location for a minimum of 12 hours to allow for evacuation of gut contents, after which each sample was rinsed in distilled water, photographed, and reweighed. Composite earthworm samples were then wrapped in aluminum foil, placed in a sealed plastic bag on dry ice, and shipped to the laboratory via overnight courier. Sample numbers and other relevant information were recorded on a chain-of-custody form included with the samples. Field documentation, including field data forms, photographs, and chain-of-custody are included in Appendices B, C, and F.

During the terrestrial biota investigation field activities, a sample numbering error occurred while processing the earthworm samples from TBSA 10 and TBSA 11. When the earthworms were being transferred from the containers in which they had been stored to evacuate their gut contents to the containers to be shipped to the laboratory, field personnel became aware that the containers from TBSA 10 and 11 may have been switched, and noted this fact. After the earthworm analytical data was received, it became apparent, based on reported PCB concentrations, that this switch had occurred. Earthworm samples K46009-K46011, which are logged on chain-of-custody forms as coming from TBSA 10, all had no detectable PCB concentrations, and samples K46012-K46014 logged as coming from TBSA 11 (reference area) all had detectable PCB concentrations. These sample numbers were corrected prior to analyses and discussion contained in this report. No other sample processing problems were suspected or encountered.

2.3 Laboratory Analysis

2.3.1 Aquatic Biota

2.3.1.1 Fish

At the laboratory, fish samples were protected from light and frozen at -20 C until prepared for homogenization. Sample processing protocols for carp and bass described in the BSP include tissue preparation and analyses of both fillet and remaining carcass samples from a single fish, allowing for the characterization of fillet and whole-body constituent concentrations used in the HHRA and BERA. Sucker species were analyzed only as whole-body samples.

Skin-off standard fillets (both fillets) were prepared for carp and skin-on standard fillets were prepared for bass. Filleting techniques followed standard Great Lakes and Environmental Assessment Section (GLEAS) Procedures (see Appendix A and F of the BSP) to obtain fillets consistent with MDNR standard edible portions for the target fish species. Remaining-carcass samples included all body fluids and offal remaining after filleting and the remainder of the fillet homogenate after removal of a suitable sample aliquot. Sucker species were prepared for analysis as whole-body samples only.

All fillet samples collected in 1993 (carp and bass) were analyzed for PCB, pesticides, total mercury, and percent lipids. PCB, pesticides, total mercury, and percent lipids were also analyzed in the 42 remaining-carcass samples (24 bass and 18 carp) as part of the pilot study. The lipid content of the remaining-carcass samples not included in the pilot study was determined. The carp and bass fillet samples with the highest PCB concentration from each sampling location were submitted for PCDD/PCDF analyses. Whole-body suckers were analyzed for PCB/pesticides, percent lipids, and total mercury. During tissue processing activities, each fish was also examined to determine gender. The fish samples collected in 1997 were analyzed for PCB and percent lipids.

The smallmouth bass and carp fillet samples collected in 1993 with the highest PCB concentrations at each of the eleven ABSAs were analyzed for PCDD/PCDF according to United States Environmental Protection Agency (USEPA) SW-846 Method 8290, as specified in the BSP. Briefly, samples were extracted using toluene in a Soxhlet/Dean-Stark extraction apparatus for 16 hours. The extracts were then washed with concentrated sulfuric acid followed by concentrated sodium hydroxide. The concentrated residue was then fractionated with a series of column cleanups including Biosil and alumina columns. The final cleanup column was a Celite 545/AX-21 carbon column. These analyses were performed in July of 1994.

All analyses were completed according to procedures specified in Appendix G of the BSP. The procedures followed USEPA SW-846 Method 8081 (PCB and pesticides) and Method 7471 (mercury). Samples were soxhlet extracted according to Method 3540, and extracts were cleaned of interferences using Methods 3630, 3640, and 3665. PCDD/PCDF analyses followed USEPA SW-846 Method 8290.

2.3.1.2 Turtles

Turtle samples were frozen at -20 C until tissue samples were prepared for homogenization. Turtles were analyzed as either whole-body samples or muscle-only samples. Both whole-body and muscle-only samples were analyzed for PCB and percent lipids. Samples were analyzed for PCB following USEPA SW-846 Method 8081, and percent lipids as presented in the Quality Assurance Project Plan (QAPP) (Blasland & Bouck, 1993). Samples were soxhlet-extracted according to Method 3540, and extracts were cleaned of interference using Methods 3630, 3640, and 3665. The turtle muscle samples with the highest total PCB concentration from each ASBA were selected to be analyzed for PCDD/PCDF following USEPA SW-846 Method 8290 (Appendix I).

Results of analyses performed on muscle-only samples will be used in the HHRA to evaluate risk to human consumers of turtles. Results of whole-body analyses are intended for evaluations of ecological risk.

All analyses were completed according to procedures specified in the BSP, and as described previously for fish.

2.3.2 Terrestrial Biota

Terrestrial biota samples were analyzed for PCB and lipids according to procedures specified in Appendix G of the BSP. Briefly, the procedures followed USEPA SW-846 Method 8081 as presented in the QAPP. Samples were soxhlet extracted according to Method 3540, and extracts were cleaned of interferences using Methods 3630 and 3640, and 3665. PCB congener and homologue distributions in samples were estimated with the chromatographic data from USEPA SW-846 Method 8081 used by Aquatec Inc. (Aquatec) and by Wadsworth Laboratory using a RTX-5 column and the analyses of commercial Aroclors reported by Schultz et al. (1989). Schultz et al. (1989) used multidimensional gas chromatograph-electron capture detector analysis to identify congeners present in commercial Aroclor mixtures. Percent lipids were determined using solvent extraction in a soxhlet extractor and mass balance procedures. Soil samples were analyzed for PCB using USEPA SW-846 Method 8081.

2.4 QA/QC Review of Data

2.4.1 Data Review Process

Data packages for the biota investigation underwent review and evaluation to assess overall analytical precision and accuracy. The analytical data from the initial round of fish and turtle sampling conducted in 1993 was organized into twenty-eight sample delivery groups (SDGs). These data was reviewed by BBL for accuracy and precision. The detailed data review prepared by BBL is presented in Appendix D, located in Volume II of VI of this Technical Memorandum.

The analytical data collected in 1994 for snapping turtles is organized into two SDGs. This data was also reviewed by BBL for accuracy and precision and the results of this review are presented in this section.

The analytical data for PCDD/PCDF analysis of fish and turtle samples performed in 1994 was organized into two SDGs. These data was reviewed by BBL for accuracy and precision and the detailed review prepared by BBL has been included in Appendix D, located in Volume II of VI of this Technical Memorandum.

The analytical data collected in 1997 for the fish was organized into eight SDGs. These data was reviewed by BBL for accuracy and precision. The detailed review prepared by BBL has been included in Appendix D, located in Volume II of VI of this Technical Memorandum.

The overall precision and accuracy summary prepared by BBL (presented in Appendix D) was prepared by reviewing QA/QC information including matrix spike/matrix spike duplicate (MS/MSD) recovery data, relative percent difference (RPD) between recoveries, matrix spike blank recovery data, field duplicate RPD calculation results, surrogate spike recovery data, blank spike recovery data, and blank contamination detection. More detailed analyses of data quality are provided in the data assessment reports for each SDG. These data assessment reports were prepared by BBL for each analysis group (PCB, pesticide, mercury, and PCDD/PCDF) and include additional information regarding sample holding times, system

performance, instrument calibration and compound identification, as well as the information on accuracy and precision previously discussed. The data review and assessment procedures were derived from applicable guidance (USEPA, 1989a; 1991; 1991c; and 1991d) and the QAPP.

The more comprehensive data assessment reports are located at the front of each data package for each SDG. They are presented in Appendix E, located in Volumes II of VI through VI of VI of this Technical Memorandum. A discussion of how the results of data assessment impact the usability of the analytical data is provided in the following subsection.

Chain-of-custody forms are presented in Appendix F.

2.4.2 Data Usability

Each data package generated for the Biota Sampling Technical Memorandum was subjected to a data review performed independently of the laboratory data review. BBL performed these reviews as previously described. As a result of the laboratory and independent reviews, some of the data for this study have been assigned data qualifiers as per USEPA guidance (USEPA, 1989a; 1991; 1991c; and 1991d). These data qualifiers are explained in the data reviews provided in Appendix E, located in Volumes II of VI through VI of VI of this Technical Memorandum. During the laboratory review process, the laboratory may assign qualifiers to the data. These qualifiers will appear on the laboratory generated data sheets. During the independent review process, laboratory reviewed data are verified against the supporting documentation. Based on this evaluation, qualifier codes are added, deleted or modified by the data reviewer and added manually to the laboratory data sheets. This allows the data user to evaluate the usability of the data for its intended purpose. It is important to note that data receiving an "R" qualifier is considered invalid and unusable. Any data qualified with an "R" should not appear in any data table or figure, nor be used in any calculations.

In the following subsection, a discussion of data usability for each biota type is provided. This discussion is based on the information provided in the QA/QC Review of Data in Appendix D (Volume II of VI of this Technical Memorandum) and the individual data assessment reports for each SDG.

1993 Fish PCB Data

No fish PCB data was rejected by either the laboratory or independent data review. Some data was qualified as estimated for several reasons, including continuing calibration problems, out-of-control surrogate recoveries and holding time exceedences. The affected data has been qualified on the data sheets and the data summaries provide explanations for the qualifications. This data as well as the unqualified data is considered usable as reported.

1993 Fish Pesticide Data

Problems with compound identification of individual pesticide compounds resulted in the qualification of and rejection of some pesticide data on a compound specific basis. A requirement of the analytical method is that the retention times of the pesticide compounds fall within calculated retention time windows for both the primary and secondary columns. When the quantitated concentrations between the two columns are greater than 25% but less than 50% for any specific compound in a sample, the data was qualified as estimated but usable. When the difference between the quantitated concentrations on the two columns was greater than 50%

but less than 90% for any specific compound in a sample, the data is considered estimated and the compound presumed present in the sample. This data is also considered usable.

However, when the difference between the quantitated concentrations on the two columns was greater than 90%, the data for those compounds in the specific sample was rejected during data review by BBL. This rejected data is considered unusable and has been struck through on the individual data sheets and qualified with an "R". The majority of the rejected data occurred for five specific pesticide compounds. Fourteen percent of all the trans-nonarochlor data was rejected for pesticides in fish. Thirty-six percent of gamma-chlordane data was rejected for pesticides in fish. Thirty-six percent of 4,4'-Dichlorodiphenyltrichloroethane (DDT) data was rejected for pesticides in fish. Eleven percent of the aldrin data was rejected for pesticides in fish and ten percent of heptachlor epoxide data was rejected for pesticides in fish. The other compounds with rejected data had less than ten percent of the data rejected. This rejected data is considered unusable.

Some additional pesticide data was qualified as estimated for several other reasons, including continuing calibration problems, out-of-control surrogate recoveries and holding time exceedences. The affected data has been qualified on the data sheets and the data summaries provide explanations for the qualifications. This data as well as the unqualified data is considered usable as reported.

1993 Fish Mercury Data

Mercury data was rejected by the laboratory for fish sample K40203. The laboratory inadvertently added spiking solution to this sample before analysis so the true mercury concentration is unknown. This data is considered unusable. Additional mercury data was qualified as estimated due to matrix spike recoveries outside the acceptable control limits. The affected data has been qualified on the data sheets and the data summaries provide explanations for the qualifications. This data as well as the unqualified data is considered usable as reported.

1993 Turtle PCB Data

No turtle PCB data was rejected by either the laboratory or independent data review. Data for three sample dilutions was qualified as estimated due to holding time exceedence. The affected data has been qualified on the data sheets and the data summaries provide explanations for the qualifications. This data as well as the unqualified data is considered usable as reported.

1994 Turtle PCB Data

The 1994 turtle data was organized into two SDGs. This data was reviewed by BBL for accuracy and precision. A more detailed analyses of data quality was also performed by BBL, which includes the discussion of precision and accuracy and is provided in the data assessment reports for each SDG located in Appendix E, Volumes II of VI through VI of VI of this Technical Memorandum.

No turtle PCB data was rejected by either the laboratory or independent data review. All the data for two samples, K42019W and K42019WRE, was qualified as estimated due to surrogate spike recoveries for both surrogate compounds being outside the control limits. The affected data has been qualified on the data sheets and the data summaries provide explanations for the qualifications. This data as well as the unqualified data is considered usable as reported.

1993 Earthworm PCB Data

No earthworm PCB data was rejected by either the laboratory or independent data review. All the data for the samples, K46000, K46006 and K46014, was qualified as estimated due to surrogate spike recoveries for both surrogate compounds being below the control limits. The affected data has been qualified on the data sheets and the data summaries provide explanations for the qualifications. This data, as well as the unqualified data is considered usable as reported.

1993 White-footed Mice PCB Data

No white-footed mice PCB data was rejected by either the laboratory or independent data review. All quality control checks were within control limits and the data was not qualified by either the laboratory or the data reviewer. This data is considered usable as reported.

1994 PCDD/PCDF Fish and Turtle Data

No fish or turtle PCDD/PCDF data was rejected by either the laboratory or independent data review. Several samples for both fish and turtle data were qualified as estimated due to out-of-control internal standard and surrogate recoveries. Specific compounds in the fish sample SDG have been qualified as “estimated maximum possible concentration (EMPC)” due to problems with second column confirmation of these compounds. Blank contamination resulted in the qualification of specific compounds in several turtle samples. The affected data has been qualified on the data sheets and the data summaries in Appendix E provide explanations for the qualifications. This data as well as the unqualified data is considered usable as reported.

1997 Fish PCB Data

No fish PCB data was rejected by either the laboratory or independent data review. Several samples contained data that was qualified as estimated due to out-of-control surrogate recoveries and compound identification problems. A majority of the data also received qualification as estimated due to exceedence of the holding time from extraction to analysis. The affected data has been qualified on the data sheets and the data summaries provide explanations for the qualifications. This data as well as the unqualified data is considered usable as reported.

3

Section
Three

Section 3

Investigation Results

3.1 Field Data - Aquatic Biota

Fish were sampled from the Kalamazoo River from August 24 to November 8, 1993. Turtle sampling was also initiated during the last week of August but was halted during the week of October 10, due to the progression of snapping turtles into hibernation. Turtle sampling was not completed in 1993. Trapping efforts resumed during the week of May 16, 1994 and continued through May 31, 1994, during which the remaining turtles were captured. Additional fish sampling was conducted between October 28 and November 23, 1997 in five of the previously sampled ABSAs. The following subsections present a summary of the observations recorded during the aquatic biota investigation sampling activities.

3.1.1 1993 Fish Sampling

Fish sampling efforts at the Site were completed as specified in the BSP, with the exception of the substitution of some species in some ABSAs, which were necessary when the sampling effort produced an insufficient number of the primary species in those ABSAs. In ABSAs 1, 3, and 9, smallmouth bass were substituted for walleye. Also, golden redhorse suckers were substituted for white suckers in ABSAs 2,4,5,6 and 7, and spotted suckers and northern hog suckers were substituted for white suckers in ABSAs 10 and 3, respectively. Table 3-1 provides a list of each fish species sampled in 1993, and the size ranges of fish caught from each ABSA. Figure 1 presents the Kalamazoo River sample locations and the location of each ABSA. More detailed locations of ABSAs are identified on Figures 2 through 9. Field data for individual fish sampled in 1993 from each ABSA is presented in Tables 3-2 through 3-12, and summarized below. Any observed external abnormalities are noted in the text.

ABSA 1

ABSA 1 is located upstream of the city of Battle Creek near I-94 (Figure 2). Being upstream of the Site, ABSA 1 is considered representative of reference conditions. Field data for individual fish retained from ABSA 1 is presented in Table 3-2.

A complete sample of smallmouth bass and white suckers was collected in the prescribed sampling area. Initial sampling efforts at this location captured an insufficient number of walleye, and thus only smallmouth bass were collected. Carp were scarce in the initial sampling area due to poor habitat. As directed by the MDNR, the carp sampling area was moved upstream to the reservoir above Ceresco Dam where a complete sample of carp was obtained with little difficulty.

All carp and white suckers retained from ABSA 1 were free from external abnormalities and appeared to be in good health. One smallmouth bass was missing its right eye.

Carp samples (three males and eight females) ranged from 1700 g to 3200 g in weight and 51 cm to 65 cm in length. Mean weight and length were 2400 g and 57 cm, respectively.

Smallmouth bass samples (four males and seven females) ranged from 470 g to 1000 g in weight and 30 cm to 41 cm in length. Mean weight and length were 820 g and 37 cm, respectively.

White sucker samples (nine males and two females) ranged from 35 g to 320 g in weight and 16 cm to 30 cm in length. Mean weight and length were 140 g and 23 cm, respectively.

ABSA 2

ABSA 2 is located near the shore of Morrow Lake (Figure 3). Field data for individual fish retained from ABSA 2 is presented in Table 3-3.

Observed external abnormalities were limited to one carp with tumorous growths located on the breast in the vicinity of the right operculum, a second carp with apparent lamprey scars, and a smallmouth bass with a leech on its caudal fin.

Individual carp samples (all females) ranged from 1300 g to 6500 g in weight and 52 cm to 76 cm in length. Mean weight and length were 3300 g and 62 cm, respectively.

Smallmouth bass samples (four males and seven females) ranged from 300 g to 1100 g in weight and 29 cm to 46 cm in length. Mean weight and length were 560 g and 35 cm, respectively.

Golden redhorse (ten males and one female) suckers were used as the forage fish species in place of the white sucker, and samples ranged from 24 g to 52 g in weight and 13 cm to 16 cm in length. Mean weight and length were 33 g and 14 cm, respectively.

ABSA 3

ABSA 3 is located directly downstream of Morrow Dam (Figure 3). Field data for individual fish retained from ABSA 3 is presented in Table 3-4.

Sampling efforts captured an insufficient number of walleye and white suckers from this location; therefore, smallmouth bass and Northern hog suckers were collected. All fish were collected from within the prescribed sampling area.

All of the carp and Northern hog suckers were free of external abnormalities. Two smallmouth bass exhibited external abnormalities; one had an ulceration present on its left maxillary, the second had a malformed left premaxillary.

Carp samples (four males and seven females) ranged from 1500 g to 4000 g in weight and 48 cm to 65 cm in length. Mean weight and length were 2300 g and 56 cm, respectively.

Smallmouth bass samples (five males and six females) ranged from 310 g to 730 g in weight and 29 cm to 40 cm in length. Mean weight and length were 450 g and 33 cm, respectively.

Northern hog sucker samples ranged from 39 g to 130 g in weight and 15 cm to 22 cm in length. Mean weight and length were 74 g and 19 cm, respectively.

ABSA 4

ABSA 4 is a relatively short segment of the Kalamazoo River just downstream of Mosel Avenue in Kalamazoo, Michigan (Figure 4). Field data for individual fish retained from ABSA 4 is presented in Table 3-5.

Golden redhorse suckers were collected as the forage fish species in place of white suckers. All fish were collected from within the prescribed sampling area.

All of the carp and golden redhorse suckers were free of external abnormalities. Two smallmouth bass exhibited external abnormalities; one was missing a cornea on the left eye, the second had a lesion on the left maxillary/operculum.

Carp samples (three males and eight females) ranged from 1300 g to 4100 g in weight and 51 cm to 65 cm in length. Mean weight and length were 2900 g and 59 cm, respectively.

Smallmouth bass samples (five males and six females) ranged from 300 g to 830 g in weight and 31 cm to 43 cm in length. Mean weight and length were 440 g and 33 cm, respectively.

Golden redhorse sucker samples (nine males and two females) ranged from 40 g to 230 g in weight and 16 cm to 26 cm in length. Mean weight and length were 88 g and 19 cm, respectively.

ABSA 5

ABSA 5 is located between the Plainwell Dam and the Highway 131 bridge in Plainwell (Figure 5). Field data for individual fish retained from ABSA 5 is presented in Table 3-6.

Golden redhorse suckers were collected as the forage fish species in place of white suckers. All fish were collected from the prescribed sampling area, and all fish were free of external abnormalities.

Carp samples (five males and six females) ranged from 1500 g to 3800 g in weight and 50 cm to 63 cm in length. Mean weight and length were 2500 g and 57 cm, respectively.

Smallmouth bass samples (four males and seven females) ranged from 290 g to 810 g in weight and 29 cm to 39 cm in length. Mean weight and length were 570 g and 35 cm, respectively.

Golden redhorse sucker samples (six males and five females) ranged from 37 g to 98 g in weight and 15 cm to 21 cm in length. Mean weight and length were 54 g and 17 cm, respectively.

ABSA 6

ABSA 6 is located between the Plainwell Dam and just upstream of Otsego City Dam (Figure 5). Field data for individual fish retained from ABSA 6 is presented in Table 3-7.

Golden redhorse suckers were collected as the forage fish species in place of white suckers. All fish were collected from within the prescribed sampling area.

All of the smallmouth bass and golden redhorse were free of external abnormalities. One carp exhibited an eroded right pectoral fin.

Carp samples (eight males and three females) ranged from 1500 g to 3000 g in weight and 49 cm to 60 cm in length. Mean weight and length were 2400 g and 55 cm, respectively.

Smallmouth bass samples (eight males and three females) ranged from 300 g to 950 g in weight and 28 cm to 42 cm in length. Mean weight and length were 600 g and 35 cm, respectively.

Golden redhorse sucker samples (seven males and four females) ranged from 35 g to 190 g in weight and 15 cm to 26 cm in length. Mean weight and length were 130 g and 22 cm, respectively.

ABSA 7

ABSA 7 is located just upstream of Otsego Dam (Figure 6). Field data for individual fish retained from ABSA 7 is presented in Table 3-8.

Golden redhorse suckers were collected as the forage fish species in place of white suckers. All fish were collected from the prescribed sampling area.

All of the smallmouth bass and golden redhorse were free of external abnormalities. One carp exhibited a lesion near the tail and exhibited evidence of spinal deformities.

Carp samples (one male and ten females) ranged from 1300 g to 3600 g in weight and 47 cm to 64 cm in length. Mean weight and length were 2300 g and 55 cm, respectively.

Smallmouth bass samples (five males and six females) ranged from 300 g to 1100 g in weight and 30 cm to 44 cm in length. Mean weight and length were 610 g and 36 cm, respectively.

Golden redhorse sucker samples (eight males and three females) ranged from 35 g to 300 g in weight and 15 cm to 30 cm in length. Mean weight and length were 170 g and 24 cm, respectively.

ABSA 8

ABSA 8 is located just upstream of the Trowbridge Dam (Figure 6). Field data for individual fish retained from ABSA 8 is presented in Table 3-9.

White suckers were collected as the forage species. All fish were collected from the prescribed sampling area, and all fish were free of external abnormalities.

Carp samples (three males and eight females) ranged from 1500 g to 3800 g in weight and 48 cm to 69 cm in length. Mean weight and length were 2500 g and 58 cm, respectively.

Smallmouth bass samples (six males and five females) ranged from 300 g to 670 g in weight and 30 cm to 38 cm in length. Mean weight and length were 450 g and 34 cm, respectively.

White sucker samples (eight males and three females) ranged from 70 g to 260 g in weight and 19 cm to 29 cm in length. Mean weight and length were 120 g and 22 cm, respectively.

ABSA 9

ABSA 9 is located near the downstream end of Lake Allegan (Figure 7). Field data for individual fish retained from ABSA 9 is presented in Table 3-10.

White suckers were collected as the forage species. Smallmouth bass were collected as the game fish species. Although carp were abundant, individual carp exceeding 58 cm in length could not be located. Therefore, the carp sample group was completed with the largest individuals the sampling crew could locate. The large population of Lake Allegan adult carp, relatively homogeneous in length and apparently stunted in growth, has been documented in previous

MDNR sampling efforts (MDNR, 1987). All fish were collected from the prescribed sampling area.

All of the smallmouth bass and white suckers were free of external abnormalities. One carp was described as emaciated.

Carp samples (four males and seven females) ranged from 1000 g to 1600 g in weight and 44 cm to 48 cm in length. Mean weight and length were 1200 g and 46 cm, respectively.

Smallmouth bass samples (five males and six females) ranged from 280 g to 1300 g in weight and 29 cm to 45 cm in length. Mean weight and length were 670 g and 36 cm, respectively.

White sucker samples (six males and five females) ranged from 53 g to 95 g in weight and 17 cm to 21 cm in length. Mean weight and length were 73 g and 19 cm, respectively.

ABSA 10

ABSA 10 is located downstream of the Allegan Dam (Figure 8). Field data for individual fish retained from ABSA 10 is presented in Table 3-11.

Sampling efforts did not result in a sufficient number of white suckers at this location; so spotted suckers were substituted as the forage fish species. All fish samples were obtained in the prescribed sampling area, although the condition of the river channel in this area (deep, very steep banks with little vegetation), required the sucker sample to be collected slightly downstream of the bass and carp sampling locations.

All suckers were free of abnormalities. One smallmouth bass had a lacerated left preopercle, and one carp had lesions on the body above the pelvic fin.

Individual carp samples (one male and ten females) ranged from 1800 g to 11000 g in weight and 49 cm to 85 cm in length. Mean weight and length were 4600 g and 62 cm, respectively.

Smallmouth bass samples (three males and eight females) ranged from 400 g to 1300 g in weight and 31 cm to 42 cm in length. Mean weight and length were 670 g and 36 cm, respectively.

Spotted sucker samples (ten males and one female) ranged from 60 g to 360 g in weight and 19 cm to 30 cm in length. Mean weight and length were 230 g and 27 cm, respectively.

ABSA 11

ABSA 11 is located near Saugatuck between Ottawa and Pottowatamie marshes (Figure 9). Field data for individual fish retained from ABSA 11 is presented in Table 3-12.

White suckers were collected as the forage species. All fish were collected from the prescribed sampling area, and all fish were free of external abnormalities.

Carp samples (five males and six females) ranged from 1700 g to 8500 g in weight and 48 cm to 76 cm in length. Mean weight and length were 3400 g and 59 cm, respectively.

Smallmouth bass samples (eight males and three females) ranged from 170 g to 1100 g in weight and 26 cm to 42 cm in length. Mean weight and length were 390 g and 29 cm, respectively.

White sucker samples (eight males and three females) ranged from 84 g to 220 g in weight and 21 cm to 28 cm in length. Mean weight and length were 130 g and 24 cm, respectively.

3.1.2 1997 Fish Sampling

ABSA 1

Physical data for carp and smallmouth bass from ABSA 1 is presented in Table 3-13. Carp were scarce at the Battle Creek ABSA (ABSA 1) due to unsuitable habitat and were therefore sampled from the upstream Ceresco Reservoir (above Ceresco Dam), just as they were in 1993. This location is also considered representative of reference conditions. Carp samples (five males and six females) ranged from 1,800 to 3,200 g in weight and 50 to 60 cm in length. Mean weight and length were 2,500 g and 56 cm, respectively. All carp samples were free of external abnormalities, with the exception of one male carp that had a small wound.

Seven male and four female smallmouth bass were collected ranging from 650 to 1,200 g in weight and 35.0 to 44 cm in length. Mean weight and length were 890 g and 38 cm, respectively. All smallmouth bass collected from Battle Creek were free of external abnormalities, although one male smallmouth bass was missing a right maxillary.

ABSA 2

Physical data for carp and smallmouth bass from ABSA 2 is presented in Table 3-14. Two male and nine female carp samples were collected at ABSA 2 ranging from 1,300 to 5,500 g in weight and 47.5 to 73.0 cm in length. Mean weight and length were 3,000 g and 60 cm, respectively. Six of the 11 carp sampled from ABSA 2 were free of external abnormalities. Four female carp had external abnormalities including papillomas, small lesions, bulbous eye, and parasites. One male carp showed discoloration between the pectoral and anal fins. Smallmouth bass samples from ABSA 2 (four males and seven females) ranged from 430 to 1,300 g in weight and 33.0 to 45 cm in length. Mean weight and length were 680 g and 36 cm, respectively. All smallmouth bass collected from Morrow Lake were free of external abnormalities, with the exception of one female with an open sore on the left maxillary.

ABSA 5

Physical data for carp and smallmouth bass from ABSA 5 is presented in Table 3-15. Carp samples from ABSA 5 (three males and eight females) ranged from 1,900 to 6,700 g in weight and 50 to 75 cm in length. Mean weight and length were 3,700 g and 61 cm, respectively. All carp were free of external abnormalities with the exception of one female carp, which was missing a right front barbell.

Smallmouth bass samples from ABSA 5 (five males and six females) ranged from 540 to 910 g in weight and 35 to 39.0 cm in length. Mean weight and length were 650 g and 37 cm, respectively. All smallmouth bass collected from Plainwell Dam were free of external abnormalities.

ABSA 9

Physical data for carp and smallmouth bass from ABSA 9 is presented in Table 3-16. Carp samples collected from ABSA 9 (four males and seven females) ranged from 1,100 to 1,800 g in weight and 47.0 to 53 cm in length. Mean weight and length were 1,400 g and 48 cm, respectively. Five of the eleven carp collected from ABSA 9 were free of external abnormalities.

Three carp showed contusions and bruised areas consistent with “live well” and electrofishing injuries. Three other carp had lesions, including a small ulceration, a papilloma, and eroded fins.

Smallmouth bass samples from ABSA 9 (eight males and three females) ranged from 490 to 1,100 g in weight and 34.0 to 41.5 cm in length. Mean weight and length were 660 g and 37 cm, respectively. Five of the eleven smallmouth bass collected from ABSA 9 were free of external abnormalities. Six fish had lesions including red eye, papilloma, small contusions, parasites, ulcers, and a tumorous growth.

ABSA 11

Physical data for carp and smallmouth bass from ABSA 11 is presented in Table 3-17. Twelve carp samples were collected from ABSA 11 (three males and nine females), ranging from 1,700 to 6,100 g in weight and 49.5 to 70 cm in length. Mean weight and length were 2,900 g and 57 cm, respectively. Eight of the twelve carp were free of external abnormalities. The remaining four carp had various lesions, including an anal fin sore, an encysted parasite, and ulcerations.

Smallmouth bass samples from ABSA 11 (seven males and four females) ranged from 570 to 1,200 g in weight and 33.5 to 43 cm in length. Mean weight and length were 860 g and 38 cm, respectively. All smallmouth bass collected from ABSA 11 were free of external abnormalities. One male smallmouth bass had a hook scar on the left mandible and another had lacerations.

3.1.3 Turtles

Turtle sampling was performed in ABSA 1, ABSA 5, and ABSA 10 in accordance with the procedures specified in the BSP. Approximate turtle trapping locations within these ABSAs are delineated on Figures 2, 5, and 8. A total of 33 snapping turtles (eleven from each area) were retained for analyses. Ten of these individuals were captured in 1993, and the remaining 23 were collected in 1994. Field data for each turtle retained for analyses is presented in Tables 3-18 through 3-20.

ABSA 1

Field data for each individual turtle retained from ABSA 1 is presented in Table 3-18.

Approximate turtle trapping locations in ABSA 1 are delineated on Figure 2. All turtles were collected from the prescribed sampling area, and all individuals were free of external abnormalities.

Individual turtles ranged from 1.80 kg to 11 kg in weight and 20 cm to 36 cm in carapace length. Mean weight and length were 4.8 kg and 27 cm.

ABSA 5

Field data for individual turtles retained from ABSA 5 is presented in Table 3-19. Approximate turtle trapping locations in ABSA 5 are shown on Figure 5. All turtles were collected from the prescribed sampling area.

External abnormalities were found on three turtles. One individual possessed a bobbed tail, a second was missing a claw from the left front foot, and a third had punctures in its shell (carapace).

Individual turtles ranged from 2.2 kg to 12 kg in weight and 21 cm to 39 cm in carapace length. Mean weight and length were 6.2 kg and 30 cm, respectively.

ABSA 10

Field data for individual turtles retained from ABSA 10 is presented in Table 3-20.

Approximate turtle trapping locations in ABSA 10 are shown on Figure 8. All turtles were collected from the prescribed sampling area.

Examinations for external abnormalities noted a malformed carapace on one individual. All others were free of external abnormalities.

Individual turtles ranged from 2.7 kg to 8.4 kg in weight and 22 cm to 32 cm in carapace length. Mean weight and length were 5.1 kg and 27 cm, respectively.

3.2 Field Data - Terrestrial Biota

The terrestrial biota field activities included the collection of soils, mice, and earthworms from the five TBSAs. The following section presents a summary of the observations recorded during the terrestrial biota sampling activities.

3.2.1 Mice

Ten adult mice from each TBSA were captured and retained for analysis. Juveniles and non-target species were released. Non-target species caught during the study included meadow voles, short-tailed shrews, rats, and a flying squirrel. A summary of the physical conditions and additional field data recorded for the mice collected from each TBSA is provided below. The physical data for all of the mice is presented in Table 3-21. Figures 10 through 14 show the specific locations of mice sample collection.

TBSA 1

No external abnormalities were observed, but a tapeworm was found in one mouse. Individual mouse samples (seven males and three females) ranged from 14 g to 26 g in weight, and 14.5 cm to 16.7 cm in length (including the tail). Mean weight and length were 20.1 g and 16.0 cm, respectively.

TBSA 3

No abnormalities were observed. One female mouse was pregnant with seven well-developed embryos. Individual mouse samples (seven males and three females) ranged from 14.0 g to 31.0 g in weight, and 13.8 cm to 18.3 cm in length. Mean weight and length were 19.5 g and 15.9 cm, respectively.

TBSA 5

One male mouse contained a parasite located in its scrotum. Two of the female mice were pregnant. Individual mouse samples (six males and four females) ranged from 15.0 g to 29.5 g in weight, and 14.8 cm to 17.4 cm in length. Mean weight and length were 20.1 g and 16.1 cm, respectively.

TBSA 10

One female mouse was pregnant with three well-developed embryos. One male exhibited enlarged testes. Individual mouse samples (seven males and three females) ranged from 14.0 g to 23.0 g in weight, and 14.8 cm to 17.8 cm in length. Mean weight and length were 18.4 g and 16.1 cm, respectively.

TBSA 11

No abnormalities were observed. Individual mouse samples (four males and six females) ranged from 12.0 g to 27.0 g in weight, and 13.0 cm to 18.1 cm in length. Mean weight and length were 18.2 g and 15.7 cm, respectively.

3.2.2 Earthworms

Three composite earthworm samples were collected from each TBSA by excavating the soil to a depth of one meter and handpicking the excavated soil. A summary of the earthworm sampling field observations and sample data for each TBSA is presented below. All earthworm physical data is presented in Table 3-22. Specific locations within each TBSA of earthworm sampling are shown in Figures 10 through 14.

TBSA 1

The three composite earthworm samples contained 67, 63, and 61 earthworms, respectively. Total sample weights ranged from 39.2 g to 49.2 g. All earthworms were from the genus *Lumbricus*.

TBSA 3

The three composite earthworm samples contained 61, 38, and 47 earthworms respectively. Total sample weights ranged from 20.3 g to 39.5 g. Two of the three samples contained only earthworms from the genus *Lumbricus* and one sample contained earthworms from both the genera *Lumbricus* and *Allolobophora*.

TBSA 5

The three composite earthworm samples contained 40, 26, 14 earthworms, respectively. Total sample weights ranged from 10.6 g to 18.6 g. All earthworms were from the genus *Lumbricus*.

TBSA 10

The three composite earthworm samples contained 63, 51, and 57 earthworms, respectively. Total sample weights ranged from 20.3 to 27.0 g. All samples included earthworms from the genera *Lumbricus*, *Aporrectodea*, and *Dendrobaena*.

TBSA 11

The three composite earthworm samples contained 25, 50, and 36 earthworms, respectively. Total sample weights ranged from 23.4 g to 26.6 g. One of the samples contained only earthworms from the genus *Lumbricus*, one of the samples contained earthworms from the genera *Lumbricus* and *Aporrectodea*, one sample contained earthworms from the genera *Lumbricus*, *Aporrectodea*, and *Dendrobaena*.

3.3 Analytical Data - Aquatic Biota

The following sections present analytical results from 121 smallmouth bass fillet samples, 121 carp fillet samples, and 121 sucker whole-body samples collected in 1993, as well as the analytical results from the pilot study samples collected in 1993, including 24 smallmouth bass remaining-carcass samples, and 18 carp remaining-carcass samples. The 1997 fish analytical results for 55 smallmouth bass and 56 carp are also presented in this section. In addition, the results of 15 whole-body minus shell turtle samples and 18 muscle-only turtle samples are presented.

3.3.1 Fish Data

Eleven fish of each species (smallmouth bass, carp, and a sucker species) from each ABSA were sent to the laboratory for constituent analyses in 1993. Summaries of the sample results for these fish are included in Tables 3-23 through 3-44. PCB were detected in all of the fish from each ABSA, with the exception of one white sucker from the reference location (ABSA 1). Mercury was detected in all fish samples. Detections of pesticides varied with location and with fish species, however, concentrations were consistently below 100 ug/kg throughout the study area. Of the 17 compounds included in the analytical program, three (4-bromobiphenyl, hexabromobiphenyl, and toxaphene) were not detected in any of the fish species submitted for analyses. In addition to these three compounds, hexachlorobenzene was not detected in any bass or sucker samples, and trans-nonachlor was not detected in any suckers from the Site.

The following sections present the range of detected concentration values for fish PCB, mercury, and lipids for those samples analyzed in 1993 and the frequency of quantification of the PCB aroclors. The frequency of detection and range of detected concentrations for pesticides at each ABSA are also presented. Results of lipid analyses on all samples (including non-pilot study carp and bass remaining-carcass samples) are presented along with the 1993 analytical data in the summary tables referenced for each ABSA and are summarized in this section.

3.3.1.1 1993 Fish PCB Data

ABSA 1

The analytical results for fish samples from ABSA 1 (Battle Creek) are presented in Tables 3-23 and 3-24.

PCB were detected in 11 of the 11 smallmouth bass fillet samples. Aroclor 1254 was quantified in 11 of the 11 smallmouth bass fillet samples and Aroclor 1260 was quantified in 9 of the 11 smallmouth bass fillet samples. PCB were detected in 6 of the 6 smallmouth bass remaining-carcass samples. Aroclor 1254 and Aroclor 1260 were quantified in 6 of the 6 smallmouth bass remaining-carcass samples.

Total PCB concentrations (quantified as Aroclors 1254 and 1260) for smallmouth bass fillets ranged from an estimated 0.049 to 0.31 mg/kg, and smallmouth bass remaining-carcass total PCB concentrations ranged from 0.21 to 0.67 mg/kg. Calculated whole-body total PCB concentrations ranged from 0.20 to 0.63 mg/kg. Lipid contents for smallmouth bass fillets ranged from 0.82 percent to 2.33 percent. Lipid contents of smallmouth bass remaining-carcass samples ranged from 2.19 percent to 7.00 percent.

PCB were detected in 11 of the 11 carp fillet samples. Aroclor 1254 was quantified in 11 of the 11 carp fillet samples and Aroclor 1260 was quantified in 10 of the 11 carp fillet samples. PCB were detected in 6 of the 6 carp remaining-carcass samples. Aroclors 1254 and 1260 were quantified in 6 of the 6 carp remaining-carcass samples.

Carp samples from Ceresco Reservoir had fillet total PCB concentrations (quantified as Aroclors 1254 and 1260) ranging from an estimated 0.055 to 0.17 mg/kg, and remaining-carcass total PCB concentrations ranged from an estimated 0.062 to 0.22 mg/kg. Calculated whole-body total PCB concentrations ranged from 0.06 to 0.26 mg/kg. Lipid contents for carp fillets ranged from 0.35 percent to 3.19 percent. Lipid contents of carp remaining-carcass samples ranged from 0.75 percent to 5.4 percent.

White suckers from ABSA 1 had detectable concentrations of PCB in 10 of 11 samples. Aroclor 1254 was quantified in 10 of the 11 white sucker samples and Aroclor 1260 was quantified in 8 of the 11 white sucker samples.

Total whole-body PCB concentrations (quantified as Aroclors 1254 and 1260) ranged from non-detect to an estimated 0.14 mg/kg. Lipid contents of white sucker whole-body samples ranged from 0.72 percent to 1.41 percent.

ABSA 2

Analytical data for fish sampled from ABSA 2 (Morrow Lake) is presented in Tables 3-25 and 3-26.

PCB were detected in 11 of the 11 smallmouth bass fillet samples. Aroclor 1254 was quantified in 11 of the 11 smallmouth bass fillet samples and Aroclor 1260 was quantified in 10 of the 11 smallmouth bass fillet samples.

Smallmouth bass fillet PCB concentrations (quantified as Aroclors 1254 and 1260) ranged from 0.10 to 0.67 mg/kg. Remaining-carcasses for fish collected from ABSA 2 were not analyzed. However, calculated whole-body PCB concentrations ranged from 0.29 to 1.4 mg/kg. Lipid contents for smallmouth bass fillets ranged from 0.44 percent to 1.52 percent. Lipid contents of smallmouth bass remaining-carcass samples ranged from 0.94 percent to 7.30 percent.

PCB were detected in 11 of the 11 carp fillet samples. Aroclor 1254 and Aroclor 1260 were quantified in 11 of the 11 carp fillet samples. PCB detected in the fillets of carp sampled from ABSA 2 (quantified as Aroclors 1254 and 1260) ranged from an estimated 0.083 to 1.9 mg/kg. Calculated whole-body total PCB concentrations for carp ranged from 0.29 to 3.8 mg/kg. Lipid contents for carp fillets ranged from 0.16 percent to 4.24 percent. Lipid contents of carp remaining-carcass samples ranged from 0.61 percent to 9.50 percent.

PCB were detected in 11 of the 11 golden redhorse sucker samples. Aroclor 1254 was quantified in 11 of the 11 golden redhorse samples and Aroclor 1260 was quantified in 9 of the 11 golden redhorse sucker samples.

For golden redhorse suckers, whole-body total PCB concentrations (quantified as Aroclors 1254 and 1260) ranged from 0.24 to an estimated 0.80 mg/kg. Lipid contents of golden redhorse sucker whole-body samples ranged from 1.25 percent to 3.98 percent.

ABSA 3

Analytical data for fish sampled from ABSA 3 (Kalamazoo River downstream of Morrow Dam) is presented in Tables 3-27 and 3-28.

PCB were detected in 11 of the 11 smallmouth bass fillet samples. Aroclor 1254 and Aroclor 1260 were quantified in 11 of the 11 smallmouth bass fillet samples.

Smallmouth bass fillet PCB concentrations (quantified as Aroclors 1254 and 1260) ranged from 0.38 to 3.2 mg/kg. Remaining-carcasses for fish collected from ABSA 3 were not analyzed. Calculated whole-body PCB concentrations for smallmouth bass ranged from 1.1 to 12 mg/kg. Lipid contents for smallmouth bass fillets ranged from 0.52 percent to 2.68 percent. Lipid contents of smallmouth bass remaining-carcass samples ranged from 2.80 percent to 14.0 percent.

PCB were detected in 11 of the 11 carp fillet samples. Aroclor 1254 and Aroclor 1260 were quantified in 11 of the 11 carp fillet samples.

Total PCB concentrations (quantified as Aroclors 1254 and 1260) in carp fillets ranged from 1.4 to 8.2 mg/kg. Calculated whole-body total PCB concentrations for carp ranged from 2.6 to 13 mg/kg. Lipid contents for carp fillets ranged from 0.89 percent to 7.40 percent. Lipid contents of carp remaining-carcass samples ranged from 1.40 percent to 13.6 percent.

PCB were detected in 11 of the 11 northern hog sucker samples. Aroclor 1254 and Aroclor 1260 were quantified in 11 of the 11 northern hog sucker samples.

Northern hog sucker whole-body total PCB concentrations (quantified as Aroclors 1254 and 1260) ranged from an estimated 0.49 to 1.0 mg/kg. Lipid contents of northern hog sucker whole-body samples ranged from 4.26 percent to 7.21 percent.

ABSA 4

Tables 3-29 and 3-30 present analytical data for fish sampled from ABSA 4 (Kalamazoo River near Mosel Avenue).

PCB were detected in 11 of the 11 smallmouth bass fillet samples. Aroclor 1254 and Aroclor 1260 were quantified in 11 of the 11 smallmouth bass fillet samples. Aroclor 1016 was quantified in 8 of the 11 smallmouth bass fillet samples and Aroclor 1242 was quantified in 1 of the 11 smallmouth bass fillet samples.

Smallmouth bass fillet PCB concentrations (quantified as Aroclors 1016, 1242, 1254, and 1260) ranged from an estimated 0.16 to 0.72 mg/kg. Remaining-carcasses for fish collected from ABSA 4 were not analyzed. However, calculated whole-body PCB concentrations for smallmouth bass were estimated to range from 0.63 to 1.9 mg/kg. Lipid contents for smallmouth bass fillets ranged from 0.32 percent to 1.49 percent. Lipid contents of smallmouth bass remaining-carcass samples ranged from 0.72 percent to 7.1 percent.

PCB were detected in 11 of the 11 carp fillet samples. Aroclor 1254 was quantified in 11 of the 11 carp fillet samples. Aroclor 1260 was quantified in 8 of the 11 carp fillet samples and Aroclor

1016 was quantified in 7 of the 11 carp fillet samples. Aroclor 1242 was quantified in 1 of the 11 carp fillet samples.

Total PCB concentrations (quantified as Aroclors 1016, 1242, 1254, and 1260) in carp fillets ranged from 1.2 to 13 mg/kg. Calculated whole-body total PCB concentrations for carp ranged from 2.4 to 19 mg/kg. Lipid contents for carp fillets ranged from 0.74 percent to 13.83 percent. Lipid contents of carp remaining-carcass samples ranged from 1.70 percent to 23.10 percent.

PCB were detected in 11 of the 11 golden redhorse sucker samples. Aroclor 1254 was quantified in 11 of the 11 golden redhorse samples. Aroclor 1260 was quantified in 10 of the 11 golden redhorse sucker samples. Aroclor 1242 was quantified in 7 of the 11 golden redhorse sucker samples and Aroclor 1016 was quantified in 3 of the 11 golden redhorse sucker samples. Aroclor 1248 was quantified in 2 of the 11 golden redhorse sucker samples.

For golden redhorse suckers, whole-body total PCB concentrations (quantified as Aroclors 1016, 1242, 1248, 1254 and 1260) ranged from 1.5 to an estimated 2.9 mg/kg. Lipid contents of golden redhorse sucker whole-body samples ranged from 2.20 percent to 5.94 percent.

ABSA 5

Analytical data for fish sampled from ABSA 5 (Kalamazoo River upstream of Plainwell Dam) is presented in Tables 3-31 and 3-32.

PCB were detected in 11 of the 11 smallmouth bass fillet samples. Aroclor 1254 was quantified in 11 of the 11 smallmouth bass fillet samples. Aroclor 1260 was quantified in 8 of the 11 smallmouth bass fillet samples, Aroclor 1242 was quantified in 1 of the 11 smallmouth bass fillet samples, Aroclor 1248 was quantified in 3 of the 11 smallmouth bass fillet samples and Aroclor 1016 was quantified in 6 of the 11 smallmouth bass fillet samples. PCB were detected in 6 of the 6 smallmouth bass remaining-carcass samples. Aroclor 1254 was quantified in 6 of the 6 smallmouth bass remaining-carcass samples. Aroclor 1260 was quantified in 5 of the 6 smallmouth bass remaining-carcass samples, Aroclor 1242 was quantified in 2 of the 6 smallmouth bass remaining-carcass samples and Aroclor 1016 was quantified in 4 of the 6 smallmouth bass remaining-carcass samples.

Smallmouth bass fillet PCB concentrations (quantified as Aroclors 1016, 1242, 1248, 1254 and 1260) ranged from 0.68 to 3.9 mg/kg. Smallmouth bass remaining-carcass total PCB concentrations (quantified as Aroclors 1016, 1242, 1254, and 1260) ranged from an estimated 2.8 to 7.2 mg/kg. Calculated whole-body PCB concentrations for smallmouth bass were estimated to range from 2.3 to 6.4 mg/kg. Lipid contents for smallmouth bass fillets ranged from 0.61 percent to 2.36 percent. Lipid contents of smallmouth bass remaining-carcass samples ranged from 1.28 percent to 7.4 percent.

PCB were detected in 11 of the 11 carp fillet samples. Aroclor 1254 was quantified in 11 of the 11 carp fillet samples and Aroclor 1248 was quantified in 10 of the 11 carp fillet samples. Aroclor 1260 was quantified in 3 of the 11 carp fillet samples and Aroclor 1242 was quantified in 1 of the 11 carp fillet samples. PCB were detected in 6 of the 6 carp remaining-carcass samples. Aroclor 1254 was quantified in 6 of the 6 carp remaining-carcass samples and Aroclor 1248 was quantified in 5 of the 6 carp remaining-carcass samples. Aroclor 1260 was quantified in 2 of the

6 carp remaining-carcass samples and Aroclor 1242 was quantified in 1 of the 6 carp remaining-carcass samples.

Carp samples from ABSA 5 had fillet total PCB concentrations (quantified as Aroclors 1242, 1248, 1254 and 1260) ranging from 1.4 to 17 mg/kg. Carp remaining-carcass total PCB concentrations ranged from 5.0 to 14 mg/kg. Calculated whole-body total PCB concentrations for carp ranged from 4.9 to 14 mg/kg. Lipid contents for carp fillets ranged from 1.42 percent to 12.03 percent. Lipid contents of carp remaining-carcass samples ranged from 5.3 percent to 17.7 percent.

PCB were detected in 11 of the 11 golden redhorse sucker samples. Aroclor 1254 was quantified in 11 of the 11 golden redhorse samples and Aroclor 1248 was quantified in 9 of the 11 golden redhorse sucker samples. Aroclor 1260 was quantified in 8 of the 11 golden redhorse sucker samples. Aroclor 1016 and Aroclor 1242 were each quantified in 1 of the 11 golden redhorse sucker samples.

Golden redhorse sucker from ABSA 5 had whole-body total PCB concentrations (quantified as Aroclors 1016, 1242, 1248, 1254 and 1260) ranged from 1.0 to 3.1 mg/kg. Lipid contents of golden redhorse sucker whole-body samples ranged from 1.18 percent to 3.78 percent.

ABSA 6

Analytical data for fish sampled from ABSA 6 (Kalamazoo River upstream of Otsego City Dam) is presented in Tables 3-33 and 3-34.

PCB were detected in 11 of the 11 smallmouth bass fillet samples. Aroclor 1254 and Aroclor 1260 were quantified in 11 of the 11 smallmouth bass fillet samples. Aroclor 1248 was quantified in 1 of the 11 smallmouth bass fillet samples and Aroclor 1016 was quantified in 3 of the 11 smallmouth bass fillet samples.

Smallmouth bass fillet PCB concentrations (quantified as Aroclors 1016, 1248, 1254, and 1260) ranged from 0.27 to 3.7 mg/kg. Remaining-carcasses for fish collected from ABSA 6 were not analyzed. However, calculated whole-body PCB concentrations for smallmouth bass were estimated to range from 0.55 to 7.2 mg/kg. Lipid contents for smallmouth bass fillets ranged from 0.51 percent to 3.73 percent. Lipid contents of smallmouth bass remaining-carcass samples ranged from 1.70 percent to 10.60 percent.

PCB were detected in 11 of the 11 carp fillet samples. Aroclor 1254 was quantified in 11 of the 11 carp fillet samples and Aroclor 1260 was quantified in 9 of the 11 carp fillet samples. Aroclor 1016 was quantified in 3 of the 11 carp fillet samples, Aroclor 1248 was quantified in 2 of the 11 carp fillet samples and Aroclor 1242 was quantified in 1 of the 11 carp fillet samples.

Carp sampled from ABSA 6 had fillet total PCB concentrations (quantified as Aroclors 1016, 1242, 1248, 1254 and 1260) ranging from 1.1 to 8.0 mg/kg. Calculated whole-body total PCB concentrations for carp ranged from 2.0 to 17 mg/kg. Lipid contents for carp fillets ranged from 0.81 percent to 7.83 percent. Lipid contents of carp remaining-carcass samples ranged from 1.36 percent to 22.0 percent.

PCB were detected in 11 of the 11 golden redhorse sucker samples. Aroclor 1254 was quantified in 11 of the 11 golden redhorse samples and Aroclor 1248 was quantified in 8 of the 11 golden redhorse sucker samples. Aroclor 1016 was quantified in 6 of the 11 golden redhorse sucker samples. Aroclor 1260 was quantified in 4 of the 11 golden redhorse sucker samples and Aroclor 1242 was quantified in 3 of the 11 golden redhorse sucker samples.

Golden redhorse whole-body total PCB concentrations (quantified as Aroclors 1016, 1242, 1248, 1254 and 1260) ranged from 0.69 to 4.6 mg/kg. Lipid contents of golden redhorse sucker whole-body samples ranged from 1.01 percent to 5.64 percent.

ABSA 7

Analytical data for fish sampled from ABSA 7 (Kalamazoo River upstream of Otsego Dam) is presented in Tables 3-35 and 3-36.

PCB were detected in 11 of the 11 smallmouth bass fillet samples. Aroclor 1254 was quantified in 11 of the 11 smallmouth bass fillet samples. Aroclor 1260 and Aroclor 1016 were each quantified in 8 of 11 smallmouth bass fillet samples. Aroclor 1248 was quantified in 3 of the 11 smallmouth bass fillet samples.

Smallmouth bass fillet total PCB concentrations (quantified as Aroclors 1016, 1248, 1254, and 1260) ranged from 0.39 to an estimated 3.7 mg/kg. Remaining-carcasses for fish collected from ABSA 7 were not analyzed. However, calculated whole-body PCB concentrations for smallmouth bass were estimated to range from 1.2 to 6.2 mg/kg. Lipid contents for smallmouth bass fillets ranged from 0.26 percent to 1.92 percent. Lipid contents of smallmouth bass remaining-carcass samples ranged from 1.50 percent to 5.30 percent.

PCB were detected in 11 of the 11 carp fillet samples. Aroclor 1254 was quantified in 11 of the 11 carp fillet samples. Aroclor 1260 and Aroclor 1242 were each quantified in 4 of the 11 carp fillet samples. Aroclor 1016 was quantified in 3 of the 11 carp fillet samples and Aroclor 1248 was quantified in 3 of the 11 carp fillet samples.

Carp sampled from ABSA 7 had fillet total PCB concentrations (quantified as Aroclors 1016, 1242, 1248, 1254 and 1260) ranging from an estimated 0.56 to 6.4 mg/kg. Calculated whole-body total PCB concentrations for carp ranged from 0.77 to 19 mg/kg. Lipid contents for carp fillets ranged from 0.80 percent to 6.84 percent. Lipid contents of carp remaining-carcass samples ranged from 0.70 percent to 12.3 percent.

PCB were detected in 11 of the 11 golden redhorse sucker samples. Aroclor 1254 was quantified in 11 of the 11 golden redhorse samples and Aroclor 1248 was quantified in 5 of the 11 golden redhorse sucker samples. Aroclor 1016 was quantified in 4 of the 11 golden redhorse sucker samples. Aroclor 1260 was quantified in 2 of the 11 golden redhorse sucker samples and Aroclor 1242 was quantified in 2 of the 11 golden redhorse sucker samples.

Golden redhorse whole-body total PCB concentrations (quantified as Aroclors 1016, 1242, 1248, 1254 and 1260) ranged from an estimated 1.5 to 2.8 mg/kg. Lipid contents of golden redhorse sucker whole-body samples ranged from 2.22 percent to 4.12 percent.

ABSA 8

Analytical data for fish sampled from ABSA 8 (Kalamazoo River upstream of Trowbridge Dam) is presented in Tables 3-37 and 3-38.

PCB were detected in 11 of the 11 smallmouth bass fillet samples. Aroclor 1254 was quantified in 11 of the 11 smallmouth bass fillet samples. Aroclor 1260 was quantified in 10 of the 11 smallmouth bass fillet samples, Aroclor 1248 was quantified in 1 of the 11 smallmouth bass fillet samples and Aroclor 1016 was quantified in 7 of the 11 smallmouth bass fillet samples. PCB were detected in 6 of the 6 smallmouth bass remaining-carcass samples. Aroclors 1254 and 1260 were each quantified in 6 of the 6 smallmouth bass remaining-carcass samples. Aroclor 1248 was quantified in 2 of the 6 smallmouth bass remaining-carcass samples and Aroclor 1016 was quantified in 1 of the 6 smallmouth bass remaining-carcass samples.

Smallmouth bass fillet PCB concentrations (quantified as Aroclors 1016, 1248, 1254, and 1260) ranged from 0.74 to 4.2 mg/kg. Smallmouth bass remaining-carcass total PCB concentrations (quantified as Aroclors 1016, 1248, 1254, and 1260) ranged from an estimated 7.0 to 13 mg/kg. Calculated whole-body PCB concentrations for smallmouth bass were estimated to range from 1.5 to 11 mg/kg. Lipid contents for smallmouth bass fillets ranged from 0.34 percent to 1.63 percent. Lipid contents of smallmouth bass remaining-carcass samples ranged from 0.83 percent to 5.78 percent.

PCB were detected in 11 of the 11 carp fillet samples. Aroclor 1254 was quantified in 11 of the 11 carp fillet samples and Aroclor 1260 was quantified in 8 of the 11 carp fillet samples. Aroclor 1248 was quantified in 4 of the 11 carp fillet samples and Aroclor 1016 was quantified in 3 of the 11 carp fillet samples. PCB were quantified in 6 of the 6 carp remaining-carcass samples. Aroclor 1254 was quantified in 6 of the 6 carp remaining-carcass samples and Aroclor 1260 was quantified in 4 of the 6 carp remaining-carcass samples. Aroclor 1248 was quantified in 2 of the 6 carp remaining-carcass samples and Aroclor 1016 was quantified in 1 of the 6 carp remaining-carcass samples.

Carp samples from ABSA 8 had fillet total PCB concentrations (quantified as Aroclors 1016, 1248, 1254 and 1260) ranging from 1.3 to 9.6 mg/kg. Carp remaining-carcass total PCB concentrations (quantified as Aroclors 1016, 1248, 1254, and 1260) ranged from 4.3 to 14 mg/kg. Calculated whole-body total PCB concentrations for carp ranged from 2.7 to 14 mg/kg. Lipid contents for carp fillets ranged from 0.51 percent to 5.65 percent. Lipid contents of carp remaining-carcass samples ranged from 0.92 percent to 8.77 percent.

White suckers from ABSA 8 had detectable concentrations of PCB in 11 of 11 samples. Aroclor 1254 and Aroclor 1260 were quantified in 11 of the 11 white sucker samples. Aroclor 1248 was quantified in 2 of the 11 white sucker samples and Aroclor 1016 was quantified in 1 of the 11 white sucker samples.

White sucker total whole-body PCB concentrations (quantified as Aroclors 1016, 1248, 1254, and 1260) ranged from an estimated 0.24 to 1.2 mg/kg. Lipid contents of white sucker whole-body samples ranged from 0.55 percent to 1.29 percent.

ABSA 9

Analytical data for fish sampled from ABSA 9 (Lake Allegan) is presented in Tables 3-39 and 3-40.

PCB were detected in 11 of the 11 smallmouth bass fillet samples. Aroclor 1254 was quantified in 11 of the 11 smallmouth bass fillet samples. Aroclor 1242 was quantified in 9 of the 11 smallmouth bass fillet samples, Aroclor 1260 was quantified in 2 of the 11 smallmouth bass fillet samples and Aroclor 1016 was quantified in 2 of the 11 smallmouth bass fillet samples. PCB were detected in 6 of the 6 smallmouth bass remaining-carcass samples. Aroclors 1254 and 1242 were each quantified in 6 of the 6 smallmouth bass remaining-carcass samples. No other Aroclors were quantified in these samples.

Smallmouth bass fillet total PCB concentrations (quantified as Aroclors 1016, 1242, 1254, and 1260) ranged from 1.6 to 5.8 mg/kg. Smallmouth bass remaining-carcass total PCB concentrations (quantified as Aroclors 1242 and 1254) ranged from 5.2 to 13 mg/kg. Calculated whole-body PCB concentrations for smallmouth bass were estimated to range from 2.7 to 11 mg/kg. Lipid contents for smallmouth bass fillets ranged from 1.23 percent to 4.71 percent. Lipid contents of smallmouth bass remaining-carcass samples ranged from 2.92 percent to 9.24 percent.

PCB were detected in 11 of the 11 carp fillet samples. Aroclor 1254 was quantified in 11 of the 11 carp fillet samples and Aroclor 1260 was quantified in 10 of the 11 carp fillet samples. Aroclor 1248 was quantified in 8 of the 11 carp fillet samples.

Carp samples from ABSA 9 had detectable concentrations of total PCB in fillets (quantified as Aroclors 1248, 1254 and 1260) ranging from an estimated 0.099 to 6.5 mg/kg. Calculated whole-body total PCB concentrations for carp ranged from 0.17 to 17 mg/kg. Lipid contents for carp fillets ranged from 0.38 percent to 2.76 percent. Lipid contents of carp remaining-carcass samples ranged from 0.68 percent to 9.40 percent.

White suckers from ABSA 9 had detectable concentrations of PCB in 11 of 11 samples. Aroclor 1254 was quantified in 11 of the 11 white sucker samples. Aroclor 1260 was quantified in 9 of the 11 white sucker samples and Aroclor 1242 was quantified in 7 of the 11 white sucker samples. Aroclor 1248 was quantified in 1 of the 11 white sucker samples and Aroclor 1016 was quantified in 2 of the 11 white sucker samples.

White sucker total whole-body PCB concentrations (quantified as Aroclors 1016, 1242, 1248, 1254 and 1260) ranged from 0.51 to 1.7 mg/kg. Lipid contents of white sucker whole-body samples ranged from 0.66 percent to 1.23 percent.

ABSA 10

Analytical data for fish sampled from ABSA 10 (Kalamazoo River downstream of Allegan Dam) is presented in Tables 3-41 and 3-42.

PCB were detected in 11 of the 11 smallmouth bass fillet samples. Aroclor 1254 was quantified in 11 of the 11 smallmouth bass fillet samples. Aroclor 1242 was quantified in 5 of the 11 smallmouth bass fillet samples, Aroclor 1016 was quantified in 4 of the 11 smallmouth bass fillet

samples and Aroclor 1248 was quantified in 2 of the 11 smallmouth bass fillet samples. Aroclor 1260 was quantified in only 1 of the 11 smallmouth bass fillet samples.

Smallmouth bass fillet total PCB concentrations (quantified as Aroclors 1016, 1242, 1248, 1254 and 1260) ranged from 1.1 to 2.4 mg/kg. Remaining-carcasses for fish collected from ABSA 10 were not analyzed. However, calculated whole-body PCB concentrations for smallmouth bass were estimated to range from 2.2 to 6.8 mg/kg. Lipid contents for smallmouth bass fillets ranged from 0.87 percent to 2.68 percent. Lipid contents of smallmouth bass remaining-carcass samples ranged from 2.40 percent to 10.6 percent.

PCB were detected in 11 of the 11 carp fillet samples. Aroclors 1254 and 1260 were each quantified in 11 of the 11 carp fillet samples. Aroclor 1248 was quantified in 6 of the 11 carp fillet samples.

Carp sampled from ABSA 10 had fillet total PCB concentrations (quantified as Aroclors 1248, 1254 and 1260) ranging from 1.9 to 17 mg/kg. Calculated whole-body total PCB concentrations for carp ranged from 2.5 to 31 mg/kg. Lipid contents for carp fillets ranged from 1.00 percent to 30.7 percent. Lipid contents of carp remaining-carcass samples ranged from 3.02 percent to 28.3 percent.

Spotted suckers from ABSA 10 had detectable concentrations of PCB in 11 of 11 samples. Aroclor 1254 was quantified in 11 of the 11 spotted sucker samples. Aroclor 1260 was quantified in 8 of the 11 spotted sucker samples and Aroclor 1248 was quantified in 4 of the 11 spotted sucker samples. Aroclor 1242 was quantified in 3 of the 11 spotted sucker samples.

For spotted suckers, total whole-body PCB concentrations (quantified as Aroclors 1242, 1248, 1254, and 1260) ranged from 0.13 to 0.92 mg/kg. Lipid contents of spotted sucker whole-body samples ranged from 0.54 percent to 1.66 percent.

ABSA 11

Analytical data for fish sampled from ABSA 11 (Kalamazoo River near Saugatuck) is presented in Tables 3-43 and 3-44.

PCB were detected in 11 of the 11 smallmouth bass fillet samples. Aroclor 1254 was quantified in 11 of the 11 smallmouth bass fillet samples. Aroclor 1248 was quantified in 7 of the 11 smallmouth bass fillet samples, Aroclor 1260 was quantified in 5 of the 11 smallmouth bass fillet samples and Aroclor 1016 was quantified in 1 of the 11 smallmouth bass fillet samples.

Smallmouth bass fillet total PCB concentrations (quantified as Aroclors 1016, 1248, 1254, and 1260) ranged from an estimated 0.13 to 0.83 mg/kg. Remaining-carcasses for fish collected from ABSA 11 were not analyzed. However, calculated whole-body PCB concentrations for smallmouth bass were estimated to range from 0.70 to 4.1 mg/kg. Lipid contents for smallmouth bass fillets ranged from 0.52 percent to 1.37 percent. Lipid contents of smallmouth bass remaining-carcass samples ranged from 3.00 percent to 11.3 percent.

PCB were detected in 11 of the 11 carp fillet samples. Aroclor 1254 was quantified in 11 of the 11 carp fillet samples. Aroclor 1260 was quantified in 7 of the 11 carp fillet samples and Aroclor 1248 was quantified in 1 of the 11 carp fillet samples.

Carp sampled from ABSA 11 had fillet total PCB concentrations (quantified as Aroclors 1248, 1254 and 1260) ranging from 1.4 to 9.1 mg/kg. Calculated whole-body total PCB concentrations for carp ranged from 1.9 to 26 mg/kg. Lipid contents for carp fillets ranged from 2.37 percent to 22.0 percent. Lipid contents of carp remaining-carcass samples ranged from 4.80 percent to 31.5 percent.

White suckers from ABSA 11 had detectable concentrations of PCB in 11 of 11 samples. Aroclor 1254 was quantified in 11 of the 11 white sucker samples. Aroclor 1248 was quantified in 9 of the 11 white sucker samples and Aroclor 1242 was quantified in 2 of the 11 white sucker samples.

White sucker whole-body total PCB concentrations (quantified as Aroclors 1242, 1248, and 1254) ranged from 0.78 to 1.6 mg/kg. Lipid contents of white sucker whole-body samples ranged from 1.11 percent to 4.41 percent.

3.3.1.2 1997 Fish PCB Data

This section presents analytical results from PCB analysis of fish collected in 1997, which includes carp fillet samples and smallmouth bass fillet samples. Summaries of the analytical results for PCB and percent lipid are provided in Tables 3-45 through 3-51. PCB concentrations were quantitated in various combinations of Aroclors 1242, 1248, 1254, and 1260, with 1254 the predominant Aroclor throughout the river. Aroclors 1242 and 1248 were only quantified in significant quantities from ABSA 5 and downstream, but Aroclors 1254 and 1260 were consistently reported in relatively similar proportions at all locations. PCB were detected in all fish from each ABSA, with the exception of one smallmouth bass fillet from ABSA 1 and one carp fillet from ABSA 2.

ABSA 1

PCB were detected in 11 of the 11 carp fillet samples collected in ABSA 1 in 1997. Aroclor 1254 was quantified in 11 of the 11 carp fillet samples and Aroclor 1260 was quantified in 4 of the 11 carp fillet samples.

The analytical results for fish collected from ABSA 1 (Battle Creek/Ceresco Reservoir) are presented in Table 3-45. Total PCB concentration in carp fillets ranged from an estimated 0.035 to 0.27 mg/kg. Lipid content of carp fillets ranged from 0.3 to 1.5 percent.

PCB were detected in 10 of the 11 smallmouth bass fillet samples collected in ABSA 1 in 1997. Aroclor 1254 was quantified in 8 of the 11 smallmouth bass fillet samples. Aroclor 1260 was quantified in 2 of the 11 smallmouth bass fillet samples.

Total PCB concentrations for smallmouth bass fillets ranged from not detected (at a detection limit of 0.050 mg/kg) to 0.080 mg/kg. Lipid content of smallmouth bass fillets ranged from 0.2 to 0.9 percent.

ABSA 2

PCB were detected in 10 of the 11 carp fillet samples collected in ABSA 2 in 1997. Aroclor 1254 was quantified in 9 of the 11 carp fillet samples and Aroclor 1260 was quantified in 10 of the 11 carp fillet samples.

The analytical results for fish collected from ABSA 2 (Morrow Lake) are presented in Table 3-46. Total PCB concentrations in carp fillets ranged from not detected to an estimated 0.65 mg/kg. Lipid content of carp fillets ranged from 0.2 to 1.0 percent.

PCB were detected in 11 of the 11 smallmouth bass fillet samples collected in ABSA 2 in 1997. Aroclor 1254 was quantified in 11 of the 11 smallmouth bass fillet samples. Aroclor 1260 was quantified in 3 of the 11 smallmouth bass fillet samples.

Total PCB concentrations in smallmouth bass fillets ranged from estimated 0.028 mg/kg to an estimated 0.34 mg/kg. Lipid content of smallmouth bass fillets ranged from 0.2 to 1.2 percent.

ABSA 5

PCB were detected in 11 of the 11 carp fillet samples collected in ABSA 5 in 1997. Aroclor 1254 and Aroclor 1248 were quantified in 11 of the 11 carp fillet samples. Aroclor 1260 was quantified in 6 of the 11 carp fillet samples. Aroclor 1242 was quantified in 1 of the 11 carp fillet samples.

The analytical results for fish sampled from ABSA 5 (Plainwell Dam) are presented in Table 3-47. Total PCB concentrations in carp fillets ranged from an estimated 1.1 mg/kg to an estimated 17 mg/kg. Lipid content of carp fillets ranged from 0.5 to 14.8 percent.

PCB were detected in 11 of the 11 smallmouth bass fillet samples collected in ABSA 5 in 1997. Aroclor 1254 was quantified in 11 of the 11 smallmouth bass fillet samples. Aroclor 1260 was quantified in 8 of the 11 smallmouth bass fillet samples. Aroclor 1248 was quantified in 6 of the 11 smallmouth bass fillet samples and Aroclor 1242 was quantified in 3 of the 11 smallmouth bass fillet samples.

Total PCB concentrations in smallmouth bass fillets ranged from an estimated 0.090 mg/kg to an estimated 1.4 mg/kg. Lipid content of smallmouth bass fillets ranged from 0.1 to 0.6 percent.

ABSA 9

PCB were detected in 11 of the 11 carp fillet samples collected in ABSA 9 in 1997. Aroclor 1254 and Aroclor 1260 were each quantified in 10 of the 11 carp fillet samples. Aroclor 1248 was quantified in 8 of the 11 carp fillet samples.

The analytical results for fish sampled from ABSA 9 (Lake Allegan) are presented in Table 3-48. Total PCB concentrations for carp fillets ranged from an estimated 0.26 mg/kg to an estimated 1.7 mg/kg. Lipid content of carp fillets ranged from 0.2 percent to 1.6 percent.

PCB were quantified in 11 of the 11 smallmouth bass fillet samples collected in ABSA 9 in 1997. Aroclor 1254 was quantified in 11 of the 11 smallmouth bass fillet samples. Aroclor 1260 was quantified in 6 of the 11 smallmouth bass fillet samples. Aroclor 1248 was quantified in 6 of the 11 smallmouth bass fillet samples and Aroclor 1242 was quantified in 2 of the 11 smallmouth bass fillet samples.

Total PCB concentrations for smallmouth bass fillets ranged from an estimated 0.16 mg/kg to an estimated 1.6 mg/kg. Lipid content of smallmouth bass fillets ranged from 0.2 mg/kg to 1.3 percent.

ABSA 11

PCB were detected in 12 of the 12 carp fillet samples collected in ABSA 11 in 1997. Aroclor 1254 and Aroclor 1260 were each quantified in 12 of the 12 carp fillet samples. Aroclor 1248 was quantified in 7 of the 12 carp fillet samples and Aroclor 1242 was quantified in 1 of the 12 carp fillet samples.

The analytical results for fish sampled from ABSA 11 (Kalamazoo River near Saugatuck/New Richmond) are presented in Table 3-49. Total PCB concentrations in carp fillets ranged from an estimated 0.36 mg/kg to an estimated 17 mg/kg. Lipid content of carp fillets ranged from 1.3 to 20.6 percent.

PCB were detected in 11 of the 11 smallmouth bass fillet samples collected in ABSA 11 in 1997. Aroclor 1254 was quantified in 9 of the 11 smallmouth bass fillet samples. Aroclor 1260 was quantified in 8 of the 11 smallmouth bass fillet samples. Aroclor 1248 was quantified in 7 of the 11 smallmouth bass fillet samples and Aroclor 1242 was quantified in 3 of the 11 smallmouth bass fillet samples.

Total PCB concentrations in smallmouth bass fillets ranged from an estimated 0.20 mg/kg to an estimated 4.3 mg/kg. Lipid content of smallmouth bass fillets ranged from 0.2 to 0.8 percent.

3.3.1.3 1993 Fish Pesticide Data

ABSA 1

Pesticide data for fish samples from ABSA 1 is summarized in Table 3-23. Three pesticide compounds were detected in smallmouth bass fillet samples from ABSA 1. These compounds include the following:

- trans-nonachlor was detected in 2 of 11 samples at concentrations of 0.0062 mg/kg and 0.0069 mg/kg;
- 4,4'-Dichlorodiphenyldichloroethylene (DDE) was detected in 10 of 11 samples with reported concentrations ranging from 0.012 mg/kg to 0.069 mg/kg; and
- 4,4'-Dichlorodiphenyldichloroethane (DDD) was detected in 2 of 11 samples at concentrations of 0.016 and 0.022 mg/kg.

Eight pesticide compounds were detected in smallmouth bass remaining-carcass samples. These compounds include the following:

- 2-bromobiphenyl was detected in 4 of 6 samples with reported concentrations ranging from 0.12 to 0.16 mg/kg;
- 3-bromobiphenyl was detected in 1 of 6 samples at an estimated concentration of 0.012 mg/kg
- aldrin was detected in 1 of 6 samples at an estimated concentration of 0.0050 mg/kg;
- heptachlor epoxide was detected in 3 of 6 samples at reported concentrations of 0.0052 mg/kg, 0.0052 mg/kg, and 0.0070 mg/kg;

- trans-nonachlor was detected in 4 of 6 samples with reported concentrations ranging from an estimated 0.0092 mg/kg to 0.014 mg/kg;
- cis-nonachlor was detected in 1 of 6 samples at a concentration of 0.0069 mg/kg;
- 4,4'-DDD was detected in 5 of 6 samples, with reported concentrations ranging from an estimated 0.010 mg/kg to 0.047 mg/kg; and
- 4,4'-DDE was detected in 6 of 6 samples at a concentration ranging from an estimated 0.037 to 0.14 mg/kg.

Two pesticide compounds were detected in carp fillets. These compounds include the following:

- 2-bromobiphenyl was detected in 1 of 11 samples at an estimated concentration of 0.043 mg/kg; and
- 4,4'-DDE was detected in 9 of 11 samples, with reported concentrations ranging from 0.0091 mg/kg to 0.052 mg/kg.

Three pesticide compounds were detected in carp remaining-carcass samples. These compounds include the following:

- 2-bromobiphenyl was detected in 1 of 6 samples at an estimated concentration of 0.071 mg/kg;
- 4,4'-DDE was detected in each of the 6 samples, with reported concentrations ranging from 0.012 to an estimated 0.035 mg/kg; and
- 4,4'-DDD was detected in 1 of 6 samples at a concentration of 0.014 mg/kg.

Two pesticide compounds were detected in white sucker whole-body samples. These compounds include the following:

- 4,4'-DDE was detected in 7 of 11 samples, with reported concentrations ranging from 0.010 mg/kg to 0.041 mg/kg; and
- 4,4'-DDD was detected in 1 of 11 samples at a concentration of 0.018 mg/kg.

ABSA 2

Pesticide data for fish samples from ABSA 2 is summarized in Table 3-25. Four pesticide compounds were detected in smallmouth bass fillet samples from ABSA 2. These compounds include the following:

- trans-nonachlor was detected in one of ten samples (one sample was rejected) at an estimated concentration of 0.0057 mg/kg;

- cis-nonachlor was detected in 2 of 11 samples at estimated concentrations of 0.0050 and 0.0092 mg/kg;
- 4,4'-DDE was detected in all of the samples at concentrations ranging from 0.011 to 0.056 mg/kg; and
- 4,4'-DDD was detected in 1 of the 11 samples, at a concentration of 0.013 mg/kg.

No smallmouth bass remaining-carcass samples were analyzed in ABSA 2. Seven pesticide compounds were detected in carp fillet samples. These compounds include the following:

- aldrin was detected in only 1 of 11 samples at an estimated concentration of 0.012 mg/kg;
- trans-nonachlor was detected in only 1 of 9 samples (2 samples were rejected) at an estimated concentration of 0.0058 mg/kg;
- alpha-chlordane was detected in 2 out of 11 samples, at reported concentrations of 0.0051 mg/kg and 0.012 mg/kg;
- gamma-chlordane was detected in 2 of 11 samples, at estimated concentrations of 0.0055 mg/kg and 0.012 mg/kg;
- cis-nonachlor was detected in 3 of 11 samples, at reported concentrations of 0.010, 0.013 and 0.021 mg/kg;
- 4,4'-DDE was detected in 9 of 11 samples, with reported concentrations ranging from an estimated 0.014 mg/kg to 0.12 mg/kg; and
- 4,4'-DDD was detected in 3 of 11 samples, at reported concentrations of 0.018, 0.030, and 0.067 mg/kg.

No carp remaining-carcass samples were analyzed in ABSA 2. Eight pesticide compounds were detected in golden redhorse sucker samples. These compounds include the following:

- gamma-BHC was detected in 1 of 11 samples at an estimated concentration of 0.0053 mg/kg;
- heptachlor epoxide was detected in 1 of 7 samples (4 samples were rejected) at a concentration of 0.0066 mg/kg;
- alpha-chlordane was detected in 1 of 11 samples at a concentration of 0.0055 mg/kg;
- aldrin was detected in 2 of 11 samples, with estimated concentrations of 0.0071 mg/kg and 0.0074 mg/kg;
- gamma-chlordane was detected in 3 of 11 samples, with estimated concentrations of 0.0052 mg/kg, 0.0056 mg/kg, and 0.0064 mg/kg;
- cis-nonachlor was detected in 3 of 11 samples, with reported concentrations of 0.0051 mg/kg, 0.0062 mg/kg, and 0.0077 mg/kg;

- 4,4'-DDE was detected in 10 of 11 samples, with reported concentrations ranging from an estimated 0.011 mg/kg to an estimated 0.040 mg/kg; and
- 4,4'-DDD was detected in 6 of 11 samples, with reported concentrations ranging from 0.011 mg/kg to 0.020 mg/kg.

ABSA 3

Pesticide data for fish samples from ABSA 3 is summarized in Table 3-27. Eight pesticide compounds were detected in the smallmouth bass fillet samples from ABSA 3. These compounds include the following:

- dieldrin was detected in 1 of 10 samples (1 sample was rejected) at an estimated concentration of 0.012 mg/kg;
- alpha-chlordane was detected in 2 of 11 samples at a concentration of 0.0060 mg/kg and 0.0074 mg/kg;
- trans-nonachlor was detected in 1 of 9 samples (2 samples were rejected) at an estimated concentration 0.028 mg/kg;
- aldrin was detected in 2 of 9 samples (2 samples were rejected) each at an estimated concentration of 0.0076 mg/kg;
- heptachlor epoxide was detected in 6 of 10 samples (1 sample was rejected), with reported concentrations ranging from 0.0050 mg/kg to 0.022 mg/kg;
- cis-nonachlor was detected in 9 of 11 samples, with reported concentrations ranging from an estimated 0.0058 mg/kg to an estimated 0.022 mg/kg;
- 4,4'-DDE was detected in each of the eleven samples at concentrations ranging from an estimated 0.019 to 0.15 mg/kg; and
- 4,4'-DDD was detected in 2 of 10 samples (1 sample was rejected) at concentrations of 0.017 mg/kg and 0.026 mg/kg.

No smallmouth bass remaining-carcass samples were analyzed in ABSA 3. Nine pesticide compounds were detected in carp fillet samples. These compounds include the following:

- gamma-BHC was detected in 1 of 11 samples at an estimated concentration of 0.0061 mg/kg;
- dieldrin was detected in 1 of 6 samples (5 samples were rejected) at an estimated concentration of 0.030 mg/kg;
- aldrin was detected in 10 of 10 samples (1 sample was rejected) at estimated concentrations ranging from 0.0087 to 0.042 mg/kg;
- heptachlor epoxide was detected in 8 of 11 samples, with reported concentrations ranging from 0.0075 mg/kg to 0.037 mg/kg;

- gamma-chlordane was detected in 8 out of 9 samples (2 samples were rejected), with estimated concentrations ranging from 0.012 mg/kg to 0.037 mg/kg;
- alpha-chlordane was detected in 7 of 11 samples, with reported concentrations ranging from 0.011 mg/kg to 0.022 mg/kg;
- cis-nonachlor was detected in 10 of 11 samples, with reported concentrations ranging from an estimated 0.014 to 0.091 mg/kg;
- 4,4'-DDE was detected in each of the 11 samples at concentrations ranging from 0.053 to 0.36 mg/kg; and
- 4,4'-DDD was detected in each of the 11 samples at concentrations ranging from 0.012 to 0.090 mg/kg.

No carp remaining-carcass samples were analyzed from ABSA 3. Six pesticide compounds were detected in northern hog sucker whole-body samples. These compounds include the following:

- heptachlor epoxide was detected in only 1 of 10 samples (1 sample was rejected) at an estimated concentration of 0.0054 mg/kg;
- 3-bromobiphenyl was detected in 7 of 11 samples, with estimated concentrations ranging from 0.010 mg/kg to 0.019 mg/kg;
- gamma-BHC was detected in 3 of 11 samples at reported concentrations of 0.0054 mg/kg, 0.0061 mg/kg, and an estimated 0.0081 mg/kg;
- gamma-chlordane was detected in each of the 11 samples at estimated concentrations ranging from 0.0058 to 0.010 mg/kg;
- and 4,4'-DDE was detected in each of the 11 samples at estimated concentrations ranging from 0.0029 to 0.049 mg/kg; and
- 4,4'-DDD was detected in 8 of 10 samples (1 sample was rejected), with estimated concentrations ranging from 0.011 to 0.015 mg/kg.

ABSA 4

Pesticide data for fish samples from ABSA 4 is summarized in Table 3-29. Two pesticide compounds were detected in the smallmouth bass fillet samples from ABSA 4. These compounds include the following:

- heptachlor epoxide was detected in 5 of 11 samples, with reported concentrations ranging from 0.0067 mg/kg to 0.0093 mg/kg; and
- 4,4'-DDE was detected in 7 of 11 samples, with estimated concentrations ranging from 0.010 mg/kg to 0.015 mg/kg.

No smallmouth bass remaining-carcass samples were analyzed from ABSA 4. Eight pesticide compounds were detected in carp fillet samples. These compounds include the following:

- 3-bromobiphenyl was detected in 1 of 11 samples at a concentrations of 0.040 mg/kg;
- aldrin was detected in each of the 11 samples at concentrations ranging from an estimated 0.012 to an estimated 0.22 mg/kg;
- gamma-chlordane was detected in each of the 11 samples at concentrations ranging from an estimated 0.0060 to an estimated 0.11 mg/kg;
- cis-nonachlor was detected in each of the 11 samples at concentrations ranging from 0.012 to 0.10 mg/kg;
- 4,4'-DDE was detected in each of the 11 samples at estimated concentrations ranging from 0.035 to 0.39 mg/kg;
- heptachlor epoxide was detected in 10 of 11 samples, with reported concentrations ranging from an estimated 0.019 mg/kg to 0.12 mg/kg;
- alpha-chlordane was detected in 10 of 11 samples, with reported concentrations ranging from 0.015 mg/kg to 0.13 mg/kg; and
- 4,4'-DDD was detected in 10 of 11 samples, with reported concentrations ranging from 0.025 mg/kg to 0.24 mg/kg.

No carp remaining-carcass samples were analyzed from ABSA 4. Six pesticide compounds were detected in golden redhorse sucker whole-body samples. These compounds include the following:

- heptachlor epoxide was detected in 4 of 4 samples (7 samples were rejected) at concentrations ranging from 0.016 to an estimated 0.048 mg/kg;
- aldrin was detected in each of the 11 samples at estimated concentrations ranging from 0.025 to 0.050 mg/kg;
- alpha-chlordane was detected in each of the 11 samples at concentrations ranging from an estimated 0.0075 to an estimated 0.021 mg/kg;
- cis-nonachlor was detected in each of the 11 samples at concentrations ranging from 0.012 to an estimated 0.028 mg/kg;
- 4,4'-DDE was detected in each of the 11 samples at concentrations ranging from an estimated 0.043 to 0.11 mg/kg; and
- 4,4'-DDD was detected in each of the 11 samples at concentrations ranging from 0.014 to 0.039 mg/kg.

ABSA 5

Pesticide data for fish samples from ABSA 5 is summarized in Table 3-31. Five pesticide compounds were detected in smallmouth bass fillet samples from ABSA 5. These compounds include the following:

- aldrin was detected in 8 of 9 samples (2 samples were rejected), with reported concentrations ranging from 0.012 mg/kg to an estimated 0.042 mg/kg;
- heptachlor epoxide was detected in 9 of 11 samples, with reported concentrations ranging from 0.010 mg/kg to 0.047 mg/kg;
- gamma-chlordane was detected in 1 of 8 samples (3 samples were rejected) at a concentration of 0.0066 mg/kg;
- alpha-chlordane was detected in 1 of 11 samples at a concentration of 0.0085 mg/kg; and
- 4,4'-DDE was detected in 8 of 11 samples with reported concentrations ranging from 0.013 to an estimated 0.055 mg/kg.

Six pesticide compounds were detected in the smallmouth bass remaining-carcass samples. These compounds include the following:

- 2-bromobiphenyl was detected in 1 of 6 samples at a concentration of 0.049 mg/kg;
- aldrin was detected in 3 of 4 samples (2 samples were rejected), with estimated concentrations ranging from 0.059 mg/kg to 0.074 mg/kg;
- heptachlor epoxide was detected in 5 of 6 samples, with reported concentrations ranging from an estimated 0.032 mg/kg to an estimated 0.11 mg/kg;
- alpha-chlordane was detected in 1 of 6 samples at a concentration of 0.015 mg/kg;
- 4,4'-DDE was detected in 5 of 6 samples, with reported concentrations ranging from an estimated 0.054 mg/kg to 0.14 mg/kg; and
- 4,4'-DDD was detected in 5 of 6 samples, with reported concentrations ranging from 0.011 mg/kg to 0.11 mg/kg.

Nine pesticide compounds were detected in carp fillet samples. These compounds include the following:

- 3-bromobiphenyl was detected in 1 of 10 samples (1 sample was rejected) at an estimated concentration of 0.0074 mg/kg;
- aldrin was detected in each of the 11 samples at estimated concentrations ranging from 0.031 to 0.42 mg/kg;
- dieldrin was detected in 1 of 11 samples at a concentration of 0.015 mg/kg;

- heptachlor epoxide was detected in 10 of 11 samples, with reported concentrations ranging from an estimated 0.019 mg/kg to an estimated 0.22 mg/kg;
- gamma-chlordane was detected in 8 of 8 samples (3 samples were rejected) at concentrations ranging from an estimated 0.010 mg/kg to 0.066 mg/kg;
- alpha-chlordane was detected in 4 of 11 samples, with reported concentrations ranging from 0.013 mg/kg to 0.049 mg/kg;
- cis-nonachlor was detected in 4 of 11 samples, with reported concentrations ranging from 0.013 mg/kg to an estimated 0.037 mg/kg;
- 4,4'-DDE was detected in 9 of 11 samples, with estimated concentrations ranging from 0.024 mg/kg to 0.18 mg/kg; and
- 4,4'-DDD was detected in each of the 11 samples at concentrations ranging from 0.010 mg/kg to 0.072 mg/kg.

Six pesticide compounds were found in carp remaining-carcass samples. These compounds include the following:

- 2-bromobiphenyl was detected in 3 of 6 samples at reported concentrations of 0.065 mg/kg, an estimated 0.10 mg/kg, and an estimated 0.13 mg/kg;
- aldrin was detected in each of the 6 samples, with estimated concentrations ranging from 0.12 to 0.29 mg/kg;
- heptachlor epoxide was detected in 5 of 6 samples, with estimated concentrations ranging from 0.044 mg/kg to 0.16 mg/kg;
- gamma-chlordane was detected in each of 4 samples (2 samples were rejected) at estimated concentrations ranging from 0.030 to 0.055 mg/kg;
- 4,4'-DDE was detected in each of the 6 samples at concentrations ranging from an estimated 0.070 to 0.14 mg/kg;
- 4,4'-DDD was detected in each of the 6 samples at concentrations ranging from 0.030 to 0.053 mg/kg.

Six pesticide compounds were detected in the golden redhorse sucker whole-body samples. These compounds include the following:

- aldrin was detected in each of the 11 samples, with estimated concentrations ranging from 0.028 to 0.060 mg/kg;

- heptachlor epoxide was detected in each of the 5 samples (6 samples were rejected), with reported concentrations ranging from 0.029 to 0.047 mg/kg;
- alpha-chlordane was detected in 5 of 11 samples, with reported concentrations ranging from 0.0057 mg/kg to 0.011 mg/kg;
- cis-nonachlor was detected in 6 of 11 samples, with reported concentrations ranging from 0.010 mg/kg to 0.020 mg/kg;
- 4,4'-DDE was detected in each of the 11 samples at estimated concentrations ranging from 0.033 to 0.057 mg/kg; and
- 4,4'-DDD was detected in each of the 11 samples at concentrations ranging from 0.010 to 0.021 mg/kg.

ABSA 6

Pesticide data for fish samples from ABSA 6 is summarized in Table 3-33. Ten pesticide compounds were detected in the smallmouth bass fillet samples from ABSA 6. These compounds include the following:

- 2-bromobiphenyl was detected in 1 of 11 samples, at an estimated concentration of 0.055 mg/kg;
- gamma-BHC was detected in 2 of 11 samples at estimated concentrations of 0.0053 mg/kg and 0.0058 mg/kg;
- aldrin was detected in 7 of 10 samples (1 sample was rejected), with estimated concentrations ranging from 0.0053 mg/kg to 0.066 mg/kg;
- dieldrin was detected in 4 of 11 samples, with reported concentrations ranging from 0.011 mg/kg to 0.073 mg/kg;
- heptachlor epoxide was detected in 5 of 9 samples (2 samples were rejected), with reported concentrations ranging from an estimated 0.0072 mg/kg to 0.056 mg/kg;
- alpha-chlordane was detected in 3 of 11 samples, with reported concentrations of an estimated 0.0051 mg/kg, 0.0052 mg/kg, and 0.0060 mg/kg
- trans-nonachlor was detected in 3 of 9 samples (2 samples were rejected), at reported concentrations of 0.011 mg/kg, 0.011 mg/kg, and 0.020 mg/kg;
- 4,4'-DDT was detected in 5 of 7 samples (4 samples were rejected), with reported concentrations ranging from and estimated 0.020 mg/kg to 0.11 mg/kg;
- 4,4'-DDE was detected in each of the 11 samples at concentrations ranging from an estimated 0.020 to an estimated 0.30 mg/kg; and
- 4,4'-DDD was detected in 6 of 11 samples, with reported concentrations ranging from an estimated 0.011 mg/kg to 0.12 mg/kg.

No smallmouth bass remaining-carcass samples were analyzed from ABSA 6.

Ten pesticide compounds were detected in carp fillet samples. These compounds include the following:

- aldrin was detected in each of the 11 samples at estimated concentrations ranging from 0.017 to 0.15 mg/kg;
- dieldrin was detected in 3 of 10 samples (1 sample was rejected) at reported concentrations of an estimated 0.015 mg/kg, 0.035 mg/kg, and an estimated 0.046 mg/kg;
- heptachlor epoxide was detected in each of 8 samples (3 samples were rejected) at concentrations ranging from an estimated 0.0065 to 0.076 mg/kg;
- gamma-chlordane was detected in 6 of 7 samples (4 samples were rejected) at estimated concentrations ranging from 0.0056 to 0.049 mg/kg;
- alpha-chlordane was detected in 6 of 11 samples, with reported concentrations ranging from an estimated 0.011 mg/kg to 0.038 mg/kg;
- trans-nonachlor was detected in 1 of 10 samples (1 sample was rejected) at an estimated concentration of 0.011 mg/kg;
- cis-nonachlor was detected in 7 of 11 samples, with reported concentrations ranging from 0.0065 mg/kg to 0.051 mg/kg;
- 4,4'-DDT was detected in 1 of 4 samples (7 samples were rejected) at an estimated concentration of 0.024 mg/kg;
- 4,4'-DDE was detected in each of the 11 samples at concentrations ranging from an estimated 0.025 to an estimated 0.32 mg/kg; and
- 4,4'-DDD was detected in 8 of 11 samples, with reported concentrations ranging from an estimated 0.0083 mg/kg to 0.15 mg/kg.

No carp remaining-carcass samples were analyzed from ABSA 6.

Seven pesticide compounds were detected in golden redhorse sucker whole-body samples. These compounds include the following:

- 2-bromobiphenyl was detected in 4 of 11 samples, with estimated concentrations ranging from 0.076 mg/kg to 0.15 mg/kg;
- aldrin was detected in each of the 11 samples at concentrations ranging from an estimated 0.015 to an estimated 0.068 mg/kg;
- heptachlor epoxide was detected in 8 of 9 samples (2 samples were rejected), with reported concentrations ranging from 0.012 mg/kg to 0.056 mg/kg;

- gamma-chlordane was detected in 1 sample (10 samples were rejected) at an estimated concentration of 0.0059 mg/kg;
- alpha-chlordane was detected in 5 of 11 samples, with reported concentrations ranging from an estimated 0.0052 mg/kg to an estimated 0.010 mg/kg;
- 4,4'-DDE was detected in each of the 11 samples, with reported concentrations ranging from an estimated 0.014 to 0.060 mg/kg; and
- 4,4'-DDD was detected in 9 of 11 samples, with reported concentrations ranging from an estimated 0.011 mg/kg to 0.026 mg/kg.

ABSA 7

Pesticide data from fish samples from ABSA 7 is summarized in Table 3-35. Seven pesticide compounds were detected in the smallmouth bass fillet samples from ABSA 7. These compounds include the following:

- aldrin was detected in 8 of 9 samples (2 samples were rejected), with estimated concentrations ranging from 0.011 mg/kg to 0.030 mg/kg;
- heptachlor epoxide was detected in 10 of 11 samples, with reported concentrations ranging from an estimated 0.0098 mg/kg to 0.078 mg/kg;
- alpha-chlordane was detected in 2 of 11 samples, with reported concentrations of 0.0058 and 0.015 mg/kg;
- cis-nonachlor was detected in 1 of 11 samples at a reported concentration of 0.017 mg/kg;
- dieldrin was detected in 1 of 11 samples at a reported concentration of 0.011 mg/kg;
- 4,4'-DDE was detected in each of 11 samples at concentrations ranging from 0.012 to 0.16 mg/kg;
- 4,4'-DDD was detected in 7 of 11 samples, with reported concentrations ranging from 0.011 mg/kg to 0.036 mg/kg.

No smallmouth bass remaining-carcass samples were analyzed from ABSA 7.

Ten pesticide compounds were detected in carp fillet samples. These compounds include the following:

- aldrin was detected in each of 11 samples at concentrations ranging from an estimated 0.014 to an estimated 0.22 mg/kg;
- dieldrin was detected in 1 of 4 samples (7 samples were rejected) at an estimated concentration of 0.010 mg/kg;

- heptachlor epoxide was detected in each of 10 samples (1 sample was rejected), with reported concentrations ranging from 0.011 to an estimated 0.069 mg/kg;
- gamma-chlordane was detected in each of 6 samples (5 samples were rejected), with estimated concentrations ranging from 0.0066 to 0.018 mg/kg;
- alpha-chlordane was detected in 9 of 11 samples, with reported concentrations ranging from an estimated 0.0050 mg/kg to 0.021 mg/kg;
- trans-nonachlor was detected in 1 of 3 samples (8 samples were rejected) at an estimated concentration of 0.010 mg/kg;
- cis-nonachlor was detected in 9 of 10 samples (1 sample was rejected), with reported concentrations ranging from an estimated 0.0054 mg/kg to 0.034 mg/kg;
- 4,4'-DDT was detected in 1 of 4 samples (7 samples were rejected) at an estimated concentration of 0.012 mg/kg;
- 4,4'-DDE was detected in each of 11 samples, with reported concentrations ranging from an estimated 0.031 to an estimated 0.17 mg/kg; and
- 4,4'-DDD was detected in each of 11 samples, with reported concentrations ranging from 0.011 to 0.076 mg/kg.

No carp remaining-carcass samples were analyzed from ABSA 7. Six pesticide compounds were detected in golden redhorse sucker whole-body samples. These compounds include the following:

- aldrin was detected in each of 11 samples, with estimated concentrations ranging from 0.037 to 0.058 mg/kg;
- dieldrin was detected in 7 of 10 samples (1 sample was rejected), with estimated concentrations ranging from 0.012 mg/kg to 0.017 mg/kg;
- heptachlor epoxide was detected in each of the 9 samples (2 samples were rejected), with reported concentrations ranging from an estimated 0.032 to an estimated 0.048 mg/kg;
- alpha-chlordane was detected in 1 of 11 samples, with a reported concentration of 0.0093 mg/kg;
- 4,4'-DDE was detected in each of the 11 samples, with reported concentrations ranging from an estimated 0.030 to an estimated 0.080 mg/kg; and
- 4,4'-DDD was detected in 10 of 11 samples, with reported concentrations ranging from 0.019 mg/kg to 0.030 mg/kg.

ABSA 8

Pesticide data for fish samples from ABSA 8 is summarized in Table 3-37. Six pesticide compounds were detected in the smallmouth bass fillet samples from ABSA 8. These compounds include the following:

- aldrin was detected in each of 11 samples, with estimated concentrations ranging from 0.013 to 0.054 mg/kg;
- heptachlor epoxide was detected in each of 11 samples, with reported concentrations ranging from 0.010 to 0.043 mg/kg;
- trans-nonachlor was detected in 1 of 9 samples (2 samples were rejected) at an estimated concentration of 0.0060 mg/kg;
- cis-nonachlor was detected in 5 of 11 samples, with reported concentrations ranging from an estimated 0.0090 mg/kg to 0.023 mg/kg;
- 4,4'-DDE was detected in each of 11 samples, with reported concentrations ranging from an estimated 0.020 to 0.10 mg/kg; and
- 4,4'-DDD was detected in 4 of 11 samples, with reported concentrations ranging from 0.014 mg/kg to 0.024 mg/kg.

Seven pesticide compounds were detected in smallmouth bass remaining-carcass samples. These compounds include the following:

- 2-bromobiphenyl was detected in 1 of 6 samples at a reported concentration of 0.095 mg/kg;
- aldrin was detected in each of 6 samples, with estimated concentrations ranging from 0.041 to 0.22 mg/kg;
- heptachlor epoxide was detected in each of 6 samples, with reported concentrations ranging from 0.036 to 0.18 mg/kg;
- trans-nonachlor was detected in 1 of 3 samples (3 samples were rejected) at a reported concentration of 0.042 mg/kg;
- cis-nonachlor was detected in 5 of 6 samples, with reported concentrations ranging from 0.036 mg/kg to an estimated 0.11 mg/kg;
- 4,4'-DDE was detected in each of 6 samples, with reported concentrations ranging from 0.18 to 0.44 mg/kg; and
- 4,4'-DDD was detected in each of 6 samples, with reported concentrations ranging from 0.021 to 0.093 mg/kg.

Seven pesticide compounds were detected in carp fillet samples. These compounds include the following:

- aldrin was detected in each of 11 samples, with reported concentrations ranging from an estimated 0.031 to 0.26 mg/kg;
- heptachlor epoxide was detected in each of 11 samples, with reported concentrations ranging from 0.013 to an estimated 0.092 mg/kg;
- gamma-chlordane was detected in each of 7 samples (4 samples were rejected), with estimated concentrations ranging from 0.0094 to 0.049 mg/kg;
- alpha-chlordane was detected in 4 of 10 samples (1 sample was rejected), with reported concentrations ranging from an estimated 0.0067 mg/kg to 0.028 mg/kg;
- cis-nonachlor was detected in 8 of 10 samples (1 sample was rejected), with reported concentrations ranging from an estimated 0.0080 mg/kg to 0.057 mg/kg;
- 4,4'-DDE was detected in each of 11 samples, with reported concentrations ranging from an estimated 0.031 to an estimated 0.21 mg/kg; and
- 4,4'-DDD was detected in each of 11 samples, with reported concentrations ranging from 0.011 to 0.091 mg/kg.

Seven pesticide compounds were detected in carp remaining-carcass samples. These compounds include the following:

- aldrin was detected in each of 6 samples, with reported concentrations ranging from an estimated 0.031 to an estimated 0.39 mg/kg;
- heptachlor epoxide was detected in 5 of 6 samples, with reported concentrations ranging from an estimated 0.011 mg/kg to an estimated 0.17 mg/kg;
- gamma-chlordane was detected in 3 of 3 samples (3 samples were rejected) at estimated concentrations of 0.017 mg/kg, 0.025 mg/kg, and 0.071 mg/kg;
- alpha-chlordane was detected in 3 of 6 samples at reported concentrations of 0.021 mg/kg, 0.037 mg/kg, and 0.045 mg/kg;
- cis-nonachlor was detected in 5 of 6 samples, with reported concentrations ranging from 0.034 mg/kg to 0.079 mg/kg;
- 4,4'-DDE was detected in each of 6 samples, with reported concentrations ranging from 0.013 to an estimated 0.35 mg/kg; and
- 4,4'-DDD was detected in each of 6 samples, with reported concentrations ranging from 0.021 to 0.14 mg/kg.

Four pesticide compounds were detected in white sucker whole-body samples. These compounds include the following:

- aldrin was detected in each of 11 samples, with estimated concentrations ranging from 0.0065 to 0.019 mg/kg;
- heptachlor epoxide was detected in each of the 10 samples (1 sample was rejected), with reported concentrations ranging from an estimated 0.0050 to an estimated 0.016 mg/kg;
- gamma-chlordane was detected in 4 of 7 samples (4 samples were rejected), with estimated concentrations ranging from 0.0051 mg/kg to 0.0079 mg/kg; and
- 4,4'-DDE was detected in 10 of 11 samples, with estimated concentrations ranging from 0.011 mg/kg to 0.034 mg/kg.

ABSA 9

Pesticide data for fish samples from ABSA 9 is summarized in Table 3-39. Nine pesticide compounds were detected in the smallmouth bass fillet samples from ABSA 9. These compounds include the following:

- aldrin was detected in each of 11 samples, with estimated concentrations ranging from 0.026 to 0.11 mg/kg
- dieldrin was detected in 2 of 9 samples (2 samples were rejected) at reported concentrations of an estimated 0.015 mg/kg and 0.070 mg/kg;
- heptachlor epoxide was detected in 9 of 11 samples, with reported concentrations ranging from 0.020 mg/kg to an estimated 0.089 mg/kg;
- gamma-chlordane was detected in 2 of 3 samples (8 samples were rejected) at estimated concentrations of 0.0094 mg/kg and 0.021 mg/kg;
- alpha-chlordane was detected in 4 of 11 samples, with reported concentrations ranging from 0.0053 mg/kg to 0.0084 mg/kg;
- cis-nonachlor was detected in 5 of 11 samples, with reported concentrations ranging from an estimated 0.011 mg/kg to an estimated 0.025 mg/kg;
- 4,4'-DDT was detected in 1 of 6 samples (5 samples were rejected) at an estimated concentration of 0.041 mg/kg;
- 4,4'-DDE was detected in each of 11 samples, with reported concentrations ranging from 0.036 to an estimated 0.19 mg/kg;
- 4,4'-DDD was detected in 8 of 11 samples, with reported concentrations ranging from an estimated 0.016 mg/kg to 0.046 mg/kg.

Seven pesticide compounds were detected in the smallmouth bass remaining-carcass samples. These compounds include the following:

- 2-bromobiphenyl was detected in 3 of 6 samples, with estimated concentrations ranging from 0.050 to 0.12 mg/kg;

- aldrin was detected in each of 6 samples, with estimated concentrations ranging from 0.090 to 0.25 mg/kg;
- heptachlor epoxide was detected in each of 6 samples, with estimated concentrations ranging from 0.072 to 0.20 mg/kg;
- gamma-chlordane was detected in each of 3 samples (3 samples were rejected) at reported concentrations of 0.035 mg/kg, an estimated 0.040 mg/kg, and 0.057 mg/kg;
- alpha-chlordane was detected in 2 of 6 samples at reported concentrations of 0.012 mg/kg and 0.019 mg/kg;
- 4,4'-DDE was detected in each of 6 samples, with reported concentrations ranging from an estimated 0.14 to an estimated 0.29 mg/kg; and
- 4,4'-DDD was detected in each of 6 samples, with reported concentrations ranging from 0.049 to 0.11 mg/kg.

Seven pesticide compounds were detected in carp fillet samples. These compounds include the following:

- aldrin was detected in 9 of 10 samples (1 sample was rejected), with estimated concentrations ranging from 0.013 mg/kg to 0.12 mg/kg;
- heptachlor epoxide was detected in 10 of 11 samples, with reported concentrations ranging from 0.0067 mg/kg to 0.071 mg/kg
- gamma-chlordane was detected in 5 of 7 samples (4 samples were rejected), with estimated concentrations ranging from 0.0081 to 0.015 mg/kg;
- alpha-chlordane was detected in 2 of 10 samples (1 sample was rejected), with reported concentrations of from 0.0051 mg/kg to 0.0052 mg/kg;
- cis-nonachlor was detected in 8 of 10 samples (1 sample was rejected), with reported concentrations ranging from an estimated 0.0056 mg/kg to 0.024 mg/kg;
- 4,4'-DDE was detected in 10 of 11 samples, with reported concentrations ranging from 0.020 mg/kg to an estimated 0.095 mg/kg; and
- 4,4'-DDD was detected in 6 of 11 samples, with reported concentrations ranging from 0.010 mg/kg to 0.040 mg/kg.

No carp remaining-carcass samples were analyzed from ABSA 9. Five pesticide compounds were detected in white sucker whole-body samples. These compounds include the following:

- aldrin was detected in each of 8 samples (3 samples were rejected), with estimated concentrations ranging from 0.0088 to 0.022 mg/kg;

- heptachlor epoxide was detected in each of 3 samples (8 samples were rejected) at reported concentrations of an estimated 0.0053 mg/kg, 0.0095 mg/kg, and an estimated 0.017 mg/kg;
- gamma-chlordane was detected in 2 of 10 samples (one sample was rejected) at estimated concentrations of 0.0050 mg/kg and 0.0093 mg/kg;
- 4,4'-DDE was detected in each of the 11 samples, with reported concentrations ranging from an estimated 0.012 to 0.038 mg/kg; and
- 4,4'-DDD was detected in 1 of 11 samples at a reported concentration of 0.011 mg/kg.

ABSA 10

Pesticide data for fish from ABSA 10 is summarized in Table 3-41. Nine pesticide compounds were detected in the smallmouth bass fillet samples from ABSA 10. These compounds include the following:

- aldrin was detected in each of 4 samples (7 samples were rejected), with estimated concentrations ranging from 0.040 to 0.045 mg/kg;
- dieldrin was detected in 1 of 6 samples (5 samples were rejected) at an estimated concentration of 0.017 mg/kg;
- heptachlor epoxide was detected in 10 of 11 samples, with reported concentrations ranging from 0.028 to 0.052 mg/kg;
- gamma-chlordane was detected in each of 4 samples (7 samples were rejected), with estimated concentrations ranging from 0.011 to 0.018 mg/kg;
- alpha-chlordane was detected in 1 of 11 samples at a reported concentration of 0.0070 mg/kg;
- cis-nonachlor was detected in each of 11 samples, with reported concentrations ranging from an estimated 0.0080 to 0.015 mg/kg;
- 4,4'-DDT was detected in 1 of 11 samples at a reported concentration of 0.010 mg/kg;
- 4,4'-DDE was detected in each of 11 samples, with reported concentrations ranging from an estimated 0.053 to 0.12 mg/kg; and
- 4,4'-DDD was detected in 8 of 11 samples, with reported concentrations ranging from 0.011 mg/kg to 0.022 mg/kg.

No smallmouth bass remaining-carcass samples were analyzed from ABSA 10. Eleven pesticide compounds were detected in carp fillet samples. These compounds include the following:

- hexachlorobenzene was detected in 1 of 11 samples, with an estimated concentration of 0.0096 mg/kg;
- aldrin was detected in 5 of 6 samples (5 samples were rejected), with estimated concentrations ranging from 0.042 mg/kg to 0.25 mg/kg;

- dieldrin was detected in 4 of 7 samples (4 samples were rejected), with reported concentrations ranging from 0.10 mg/kg to 0.31 mg/kg;
- heptachlor epoxide was detected in 7 of 9 samples (2 samples were rejected), with reported concentrations ranging from 0.018 mg/kg to 0.20 mg/kg;
- gamma-chlordane was detected in 8 of 9 samples (2 samples were rejected) at estimated concentrations ranging from 0.010 mg/kg to 0.18 mg/kg;
- alpha-chlordane was detected in 8 of 11 samples, with reported concentrations ranging from 0.012 mg/kg to 0.25 mg/kg;
- trans-nonachlor was detected in 4 of 6 samples (5 samples were rejected), with reported concentrations ranging from an estimated 0.049 mg/kg to 0.24 mg/kg;
- cis-nonachlor was detected in 10 of 11 samples, with reported concentrations ranging from an estimated 0.011 mg/kg to 0.11 mg/kg;
- 4,4'-DDT was detected in 1 of 2 samples (9 samples were rejected) at a reported concentration of 0.038 mg/kg;
- 4,4'-DDE was detected in 10 of 11 samples, with reported concentrations ranging from 0.060 mg/kg to 1.0 mg/kg; and
- 4,4'-DDD was detected in 10 of 11 samples, with reported concentrations ranging from 0.010 mg/kg to 0.26 mg/kg.

No carp remaining-carcass samples were analyzed from ABSA 10. Two pesticide compounds were detected in the spotted sucker whole-body samples. These compounds include the following:

- heptachlor epoxide was detected in 2 of 11 samples at reported concentrations of 0.0058 mg/kg and an estimated 0.0075 mg/kg; and
- 4,4'-DDE was detected in 7 of 11 samples, with reported concentrations ranging from an estimated 0.012 mg/kg to an estimated 0.019 mg/kg.

ABSA 11

Pesticide data for fish samples from ABSA 11 is summarized in Table 3-43. Six pesticide compounds were detected in the smallmouth bass fillet samples from ABSA 11. These compounds include the following:

- aldrin was detected in 5 of 6 samples (5 samples were rejected), with estimated concentrations ranging from 0.0059 mg/kg to 0.022 mg/kg;
- heptachlor epoxide was detected in 4 of 11 samples, with reported concentrations ranging from 0.0071 mg/kg to 0.016 mg/kg;

- gamma-chlordane was detected in 1 of 9 samples (2 samples were rejected) at an estimated concentration of 0.0062 mg/kg;
- trans-nonachlor was detected in 1 of 11 samples at an estimated concentration of 0.0081 mg/kg;
- cis-nonachlor was detected in 3 of 10 samples (1 sample was rejected) at reported concentrations of an estimated 0.0063 mg/kg, an estimated 0.0071 mg/kg, and 0.0075 mg/kg; and
- 4,4'-DDE was detected in each of 11 samples, with reported concentrations ranging from 0.013 to 0.067 mg/kg.

No smallmouth bass remaining-carcass samples were analyzed from ABSA 11. Eleven pesticide compounds were detected in carp fillet samples. These compounds include the following:

- 2-bromobiphenyl was detected in 1 of 7 samples (4 samples were rejected) at an estimated concentration of 0.054 mg/kg;
- hexachlorobenzene was detected in 2 of 11 samples at estimated concentrations of 0.0087 mg/kg and 0.012 mg/kg;
- aldrin was detected in 8 of 8 samples (3 samples were rejected), with estimated concentrations ranging from 0.023 to 0.11 mg/kg;
- dieldrin was detected in 3 of 10 samples (1 sample was rejected) at reported concentrations of 0.073 mg/kg, 0.13 mg/kg, and an estimated 0.18 mg/kg;
- heptachlor epoxide was detected each of 11 samples, with reported concentrations ranging from an estimated 0.029 to 0.10 mg/kg;
- gamma-chlordane was detected in 4 of 4 samples (7 samples were rejected), with reported ranging from an estimated 0.038 mg/kg to 0.063 mg/kg;
- alpha-chlordane was detected in 10 of 11 samples, with reported ranging from 0.010 mg/kg to an estimated 0.11 mg/kg;
- trans-nonachlor was detected in 4 of 6 samples (5 samples were rejected), with reported concentrations ranging from an estimated 0.024 mg/kg to an estimated 0.11 mg/kg;
- cis-nonachlor was detected in 5 of 11 samples, with reported concentrations ranging from an estimated 0.020 mg/kg to 0.30 mg/kg;
- 4,4'-DDE was detected in 11 of 11 samples, with reported concentrations ranging from 0.12 to an estimated 0.55 mg/kg; and
- 4,4'-DDD was detected in each of 11 samples, with reported concentrations ranging from 0.025 to 0.11 mg/kg.

No carp remaining-carcass samples were analyzed from ABSA 11. Three pesticide compounds were detected in golden redhorse sucker whole-body samples. These compounds include the following:

- aldrin was detected in each of 7 samples (4 samples were rejected), with estimated concentrations ranging from 0.017 to 0.043 mg/kg;
- heptachlor epoxide was detected in each of 10 samples (1 sample was rejected), with reported concentrations ranging from 0.018 to 0.031 mg/kg; and
- 4,4'-DDE was detected in each of the 11 samples, with reported concentrations ranging from an estimated 0.023 to an estimated 0.037 mg/kg.

3.3.1.4 1993 Fish Mercury Data

Mercury was detected in all fish samples of all species in each ABSA. Therefore, no ABSA specific frequency of detection discussion is included in the following subsections.

ABSA 1

Estimated concentrations of mercury detected in smallmouth bass from ABSA 1 ranged from 0.03 to 0.12 mg/kg in fillet samples and 0.04 to 0.11 mg/kg in remaining-carcasses. In carp, estimated mercury concentrations ranged from 0.03 to 0.16 mg/kg in fillets and from 0.04 to 0.16 mg/kg in remaining-carcasses. In whole-body white sucker samples, mercury was detected at a range from 0.01 to 0.05 mg/kg.

ABSA 2

In smallmouth bass fillet samples collected from ABSA 2, estimated mercury concentrations ranged from 0.07 to 0.89 mg/kg. In carp fillets mercury concentrations ranged from 0.05 to 0.12 mg/kg. In whole-body golden redhorse sucker samples mercury was estimated at concentrations ranging from 0.01 to 0.02 mg/kg.

ABSA 3

In smallmouth bass fillet samples collected from ABSA 3, estimated mercury concentrations ranged from 0.04 to 0.10 mg/kg. In carp fillets mercury concentrations ranged from 0.03 to 0.14 mg/kg. In whole-body northern hog sucker samples estimated mercury concentrations ranged from 0.01 to 0.02 mg/kg.

ABSA 4

In smallmouth bass fillet samples collected from ABSA 4, mercury concentrations ranged from 0.11 to 0.32 mg/kg. In carp fillets mercury concentrations ranged from an estimated 0.06 to 0.16 mg/kg. In whole-body golden redhorse sucker samples mercury concentrations ranged from 0.01 to 0.02 mg/kg.

ABSA 5

Concentrations of mercury detected in smallmouth bass samples collected from ABSA 5 ranged from 0.07 to 0.36 mg/kg in fillets and from 0.05 to 0.28 mg/kg in remaining-carcasses. In carp, detected mercury concentrations ranged from 0.03 to an estimated 0.13 mg/kg in fillets and from 0.01 to 0.07 mg/kg in remaining-carcasses. In whole-body golden redhorse sucker samples mercury was detected at concentrations ranging from 0.02 to 0.03 mg/kg.

ABSA 6

In smallmouth bass fillet samples collected from ABSA 6, mercury concentrations ranged from 0.09 to 0.31 mg/kg. In carp fillets mercury concentrations ranged from an estimated 0.05 to an estimated 0.26 mg/kg. In whole-body golden redhorse sucker samples mercury concentrations ranged from 0.02 to 0.03 mg/kg.

ABSA 7

In smallmouth bass fillet samples collected from ABSA 7, estimated mercury concentrations ranged from 0.10 to 0.33 mg/kg. In carp fillets mercury concentrations ranged from 0.03 to 0.13 mg/kg. In whole-body golden redhorse sucker samples mercury concentrations ranged from 0.02 to 0.04 mg/kg.

ABSA 8

Estimated concentrations of mercury detected in smallmouth bass samples collected from ABSA 8 ranged from 0.07 to 0.36 mg/kg in fillets and from 0.05 to 0.33 mg/kg in remaining-carasses. In carp, detected mercury concentrations ranged from an estimated 0.03 to an estimated 0.30 mg/kg in fillets and from an estimated 0.07 to an estimated 0.25 mg/kg in remaining-carasses. In whole-body white sucker samples, mercury was detected at concentrations ranging from 0.02 to 0.08 mg/kg.

ABSA 9

Concentrations of mercury detected in smallmouth bass samples collected from ABSA 9 ranged from an estimated 0.10 to 0.24 mg/kg in fillets and from 0.08 to 0.19 mg/kg in remaining-carasses. In carp, fillets mercury concentrations ranged from 0.10 to 0.30 mg/kg. In whole-body white sucker samples mercury concentrations ranged from 0.03 to 0.05 mg/kg.

ABSA 10

In smallmouth bass fillet samples collected from ABSA 10, estimated mercury concentrations ranged from 0.04 to 0.17 mg/kg. In carp fillets mercury concentrations ranged from an estimated 0.09 to 0.42 mg/kg. In whole-body spotted sucker samples mercury concentrations ranged from 0.02 to 0.05 mg/kg.

ABSA 11

In smallmouth bass fillet samples collected from ABSA 11, estimated mercury concentrations ranged from 0.04 to 0.33 mg/kg. In carp fillets estimated mercury concentrations ranged from 0.08 to 0.26 mg/kg. In whole-body white sucker samples mercury concentrations ranged from 0.03 to 0.05 mg/kg (results of one sample were rejected).

3.3.1.5 1994 Fish PCDD/PCDF Data

The fish samples collected in 1993 with the highest concentration of PCB from each of the 11 ABSAs were selected for PCDD/PCDF analysis in 1994. Table 3-50 provides a summary of the selected samples from each ABSA including field data, lipid content, and maximum detected PCB concentrations. Results of PCDD/PCDF analyses in the selected smallmouth bass and carp fillets are presented in Table 3-51. It should be noted that the carp sample selected for PCDD/PCDF analysis from ABSA 1 did not exhibit the highest detected PCB concentration at

that location. The selected sample (PCB concentration of 0.057 mg/kg) was inadvertently selected in place of the sample with the true maximum observed PCB concentration of 0.17 mg/kg. PCDDs were detected in nine of the eleven bass samples and in each of the eleven carp samples, including both the bass and carp sample from ABSA 1 (the reference location) and the carp sample from ABSA 2 (Morrow Pond). PCDFs were detected in each of the eleven bass samples and ten of the eleven carp samples, including the bass sample from ABSA 1 and both the bass and carp sample from ABSA 2.

Results for 2,3,7,8-tetrachlorinated dibenzo-p-dioxin (2,3,7,8-TCDD) analysis in bass and carp ranged from not detected to 16 nanograms per kilogram (ng/kg) or parts per trillion. 2,3,7,8-TCDD was detected in eight of the eleven smallmouth bass samples and nine of the eleven carp samples, including the carp sample from ABSA 2.

Results for 2,3,7,8-tetrachlorinated dibenzofuran (2,3,7,8-TCDF) analysis in bass and carp ranged from not detected to 17.5 ng/kg. 2,3,7,8-TCDF was detected in each of the eleven bass samples and in seven of the eleven carp samples, including the bass sample from ABSA 1, and both the bass and carp samples from ABSA 2.

As shown in Table 3- 51, penta-, hexa-, hepta-, and octachlorinated PCDD and PCDF congeners also were detected in some of the bass and carp samples.

3.3.2 Turtle Data

A summary of the analytical data for snapping turtles from ABSAs 1, 5, and 10 is presented in Tables 3-52 through 3-55. PCB were detected in most turtles analyzed with the exception of one muscle sample from ABSA 1, one muscle sample from ABSA 10 and one whole-body sample from ABSA 10. PCB detections were quantified as Aroclor 1260 in all but one sample.

ABSA 1

Eleven snapping turtles were collected from ABSA 1 (upstream of Battle Creek). PCB were detected in five of the six muscle samples, and all were quantified as Aroclor 1260. PCB concentrations ranged from not detected (at 0.050 mg/kg) to 8.1 milligrams per kilogram (mg/kg wet weight). Lipid content of muscle samples ranged from 0.08 percent to 0.34 percent.

PCB were detected in each of the five whole-body samples at concentrations ranging from an estimated 0.15 mg/kg to 0.49 mg/kg and all quantified as Aroclor 1260. Lipid content of whole-body samples ranged from 0.05 percent to 5.68 percent.

ABSA 5

Eleven snapping turtles were collected from ABSA 5 (Kalamazoo River upstream of Plainwell Dam). PCB were detected in each of the six muscle samples at concentrations ranging from 0.23 mg/kg to 1.9 mg/kg and all were quantified as Aroclor 1260. Lipid content of snapping turtle muscle samples ranged from 0.44 percent to 1.02 percent.

In whole-body samples from ABSA 5, PCB were detected in each of the five samples at concentrations ranging from 0.27 mg/kg to 1.5 mg/kg and all are quantified as Aroclor 1260. Lipid content of whole-body samples ranged from 0.48 percent to 4.18 percent.

ABSA 10

Eleven snapping turtles were collected from ABSA 10 (downstream of Allegan Dam). PCB were detected in five of the six muscle samples, and all were quantified as Aroclor 1260. PCB concentrations ranged from not detected (at 0.050 mg/kg) to 0.25 mg/kg. Lipid content of muscle samples ranged from 0.04 percent to 0.17 percent.

In whole-body samples from ABSA 10, PCB were detected in four of the five samples. PCB concentrations ranged from not detected (at 0.050 mg/kg) to 7.9 mg/kg. PCB were primarily quantified as 1260, with the exception of one sample where PCB was quantified as a mixture of Aroclor 1254 and Aroclor 1260. Lipid content of whole-body samples ranged from 0.58 percent to 5.5 percent.

Results of PCDD/PCDF analyses in snapping turtle muscle samples are presented in Table 3-55. PCDDs were detected in each of the three samples including the muscle sample from the reference location (ABSA 1). PCDFs also were detected in the three muscle samples.

The compound, 2,3,7,8-TCDD was detected in two of the three turtle muscle samples at an estimated concentration of 0.78 ng/kg from the ABSA 10 sample, and 4.1 ng/kg from the ABSA 5 sample. 2,3,7,8-TCDF also was detected in the three turtle muscle samples, with concentrations ranging from 0.11 ng/kg to an estimated 0.20 ng/kg. As shown in Table 3-55, penta-, hexa-, hepta-, and octachlorinated PCDD and PCDF congeners also were detected in some of the turtle samples.

3.4 Analytical Data - Terrestrial Biota

Soil samples and terrestrial biota samples (earthworms and white-footed mice) were collected from the five TBSAs and analyzed for PCB. The following sections summarize the soil, earthworm, and mouse analytical results.

3.4.1 Soils

PCB analytical data for the TBSA soil samples is reported in detail in Addendum to Technical Memorandum 2 - Results of Phase II TBSA Soil Sampling (BBL 2000) and are summarized in Table 3-56. PCB were detected in all of the soil samples collected from on-site TBSAs 1, 3, 5, and 10. At the reference location (TBSA 11), PCB were detected in two of the five soil samples.

Soil total PCB concentrations from TBSA 1 (quantified as Aroclors 1242, 1248, 1254, and 1260) ranged from 0.065 (duplicate sample concentration of 0.077 mg/kg) to an estimated 0.20 mg/kg. Soil total PCB concentrations from TBSA 3 (quantified as Aroclors 1248, 1254, and 1260) ranged from an estimated 20 to 33 mg/kg. Soil total PCB concentrations from TBSA 5 (quantified as Aroclors 1248, 1254, and 1260) ranged from an estimated 24 to 35 mg/kg. Soil PCB concentrations from TBSA 10 (quantified as Aroclor 1248 and 1254) ranged from 4.2 to 10 mg/kg. The two detected PCB concentrations from the reference location (TBSA 11) were an estimated 0.28 mg/kg and 0.39 mg/kg quantified as Aroclors 1248 and 1254.

3.4.2 Mice

Ten individual whole-body (minus gut load) white-footed mouse samples from each TBSA were analyzed for PCB and percent lipids. White-footed mouse analytical results are presented

in Table 3-57. PCB were detected in mice collected from on-site TBSAs 1, 3, 5, and 10. PCB were not detected in any of the mouse samples collected from the reference location (TBSA 11). All of the PCB concentrations detected in the mouse samples were reported as Aroclor 1260.

PCB were detected in eight out of ten samples from TBSA 1. Wet-weight PCB concentrations from TBSA 1 ranged from not detected to 0.35 mg/kg. PCB were detected in eight out of ten samples from TBSA 3. Wet-weight PCB concentrations in TBSA 3 samples ranged from not detected to 0.45 mg/kg. PCB were detected in all ten samples from TBSA 5, ranging from 0.089 to 0.38 mg/kg. PCB were detected in seven out of ten samples from TBSA 10 where wet-weight PCB concentrations ranged from not detected to 0.28 mg/kg.

The dominant homologues in the detected PCB samples were Penta-CB, Hexa-CB, Hepta-CB, and Octa-CB, with Hexa-CB consistently the most frequent. The mean homologue distribution for TBSA 1 mouse samples was 2.5 percent Di-CB, 6.7 percent Tri-CB, 2.3 percent Tetra-CB, 17 percent Penta-CB, 37 percent Hexa-CB, 22 percent Hepta-CB, and 12 percent Octa-CB. Samples from TBSA 3 exhibited the following homologue distributions: 1.6 percent Di-CB, 4.1 percent Tri-CB, 4.3 percent Tetra-CB, 12 percent Penta-CB, 35 percent Hexa-CB, 28 percent Hepta-CB, and 15 percent Octa-CB. The mean homologue distributions for TBSA 5 mouse samples was 0.81 percent Di-CB, 2.7 percent Tri-CB, 5.3 percent Tetra-CB, 6.1 percent Penta-CB, 40 percent Hexa-CB, 35 percent Hepta-CB, and 11 percent Octa-CB. TBSA 10 mouse sample mean homologue distribution was 1.1 percent Di-CB, 2.9 percent Tri-CB, 2.1 percent Tetra-CB, 13 percent Penta-CB, 42 percent Hexa-CB, 29 percent Hepta-CB, and 10 percent Octa-CB.

3.4.3 Earthworms

Three composite whole-body earthworm samples were collected from each of the five TBSAs and analyzed for PCB and percent lipids. The earthworm analytical results and Aroclor-specific data are presented in Table 3-58. PCB were detected in earthworm samples from the four TBSAs within the Site, but were not detected in earthworms from the reference location (TBSA 11).

Total PCB concentrations in earthworm composite samples in TBSA 1 were estimated to range from 0.023 mg/kg to 0.025 mg/kg. All PCB detections were quantified as Aroclor 1260.

Total PCB concentrations in earthworm composite samples in TBSA 3 ranged from 2.1 mg/kg to 3.2 mg/kg. PCB were quantified as Aroclor 1248 and Aroclor 1254.

Total PCB concentrations in earthworm composite samples in TBSA 5 ranged from an estimated 1.3 mg/kg to 2.2 mg/kg. PCB were quantified as Aroclor 1254 and Aroclor 1248.

Total PCB concentrations in earthworm composite samples in TBSA 10 ranged from an estimated 0.13 mg/kg to 0.66 mg/kg. PCB were quantified as Aroclor 1254 and Aroclor 1248.

4

Section Four

Section 4

Preliminary Findings

4.1 Aquatic Biota Investigation

This section presents preliminary findings of the aquatic biota investigation. It includes a discussion of fisheries observations, determinants of tissue PCB concentrations and a comparison of detected concentrations to applicable standards and guidelines. Table 4-1 compares the PCB and lipid levels in fish between 1993 and 1997.

4.1.1 1993 Fisheries Observations

The vast majority of the fish collected in 1993 from the Kalamazoo River were free from external anomalies. No pattern was observed in the spatial distribution of anomalous carp. Physical abnormalities of carp included tumorous growths, spinal deformities, and lesions. Only six carp in all displayed notable external abnormalities.

Six of the seven reported bass collected in 1993 with physical abnormalities occurred in ABSAs 1 through 4. None of the observed marks on the smallmouth bass was lesions or tumors. All of the marks found on smallmouth bass could be associated with normal damage that occurs during feeding activity.

4.1.2 1997 Fisheries Observations

The majority of fish collected from the Kalamazoo River in 1997 were free from external abnormalities. In all, 70 percent of carp (fillets) and 84 percent of smallmouth bass (fillets) had no external markings. External abnormalities present on some carp and smallmouth bass included lesions, papillomas, and ulcerations. Some of the reported lesions (i.e., bruising, abrasions, and injuries to the maxilla and mandible) may be associated with “fishing injuries” and/or electro fishing and other fish collection methods used in the investigations. Fish collected from ABSAs 2 and 9 in 1997 displayed the greatest number of external abnormalities, and fish collected from ABSAs 1 and 5 had the fewest abnormalities. The highest rate of physical abnormalities was observed at ABSA 9.

4.1.3 Determinants of Fish Tissue PCB Concentrations

Consistent with findings in other investigations, PCB concentration in fish was more strongly correlated with percent lipids than other parameters (i.e., length, weight, and gender). Results of statistical analyses indicate that lipid-based concentrations provide an additional means of evaluating risks associated with PCB in resident fish. Typically, to compare relative PCB uptake across species when evaluating human health risk, lipid normalized PCB concentrations are preferred. When evaluating total PCB uptake and potential dose for both human health and ecological risk evaluation, lipid-based PCB concentrations would not be used.

Factors affecting PCB bioaccumulation in fish include those related to the availability of PCB within various media (e.g., food items, water, sediment) in the aquatic environment, and those related to certain properties of the fish, such as life history, migratory and other behavioral patterns, diet or more generally trophic level, metabolic rate, and fat (i.e., lipid) content.

Distribution of observed wet-weight PCB concentrations in fish from a given location at a single point in time are typically characterized by high standard deviations relative to the mean. Much of this variability is often attributable to variations in the lipid concentrations in fish at that location. The thermodynamic basis for the observations of increasing wet-weight PCB concentration with increasing lipid content and its practical applications of lipid-based PCB observations for analyzing trends and gradients is documented in a number of studies.

MDNR (MDNR, 1987) evaluated data from 81 carp from Lake Allegan to examine relationships between wet-weight PCB concentrations and other variables. Bivariate regression analyses were performed to determine the correlation between wet-weight PCB concentration and length, weight, and lipid content. These analyses showed that length ($R^2 = 0.04$) and weight ($R^2 = 0.03$) were not strongly related to wet-weight PCB concentration. Lipid content, however, was strongly correlated ($R^2 = 0.71$) to wet-weight PCB concentration.

The scientific literature as well as historical data from the Kalamazoo River indicate that lipid-normalized PCB concentrations provide an additional means of evaluating PCB in resident fish populations in addition to wet-weight PCB concentrations. To normalize wet-weight tissue PCB concentrations to a lipid basis, the concentration of PCB per unit weight of lipid is calculated as follows:

$$\text{Lipid-Normalized PCB (mg PCB/kg lipid)} = \frac{\text{wet-weight PCB (mg PCB/kg flesh)}}{\text{Lipid Fraction (kg lipid/kg flesh)}}$$

To evaluate the utility of lipid-based 1993 PCB data for Kalamazoo River fish, regression analyses of total PCB concentration versus lipid content, length, and weight were performed using the 1993-biota investigation data. Linear regressions were performed for each fish species at each ABSA. Coefficients of determination (R^2) from these regression analyses are presented in Table 4-2, and demonstrate that in most cases, lipid content is more strongly correlated with total PCB concentration in fish than with the other parameters. Lipid content accounts for a significant portion of the variability in wet-weight total PCB concentration. When PCB is normalized by lipid content the results are directly comparable and variability of PCB per unit lipid is usually less than that of wet-weight PCB concentration. Table 4-2 compares the coefficients of variation for wet-weight PCB and lipid-normalized fish, whole body samples.

Sex was also investigated as a possible contributor to observed variability in 1993 fish PCB concentrations. Two-way analyses of variance (ANOVA) were performed with sex and location as classification variables and wet-weight and lipid-normalized PCB concentrations as dependent variables. ANOVAs were performed for carp and smallmouth bass using both fillet and remaining-carcass data. Differences between locations were highly significant ($p < 0.01$) for

all analyses. Sex was not a significant contributor to variability in any case except for wet-weight PCB levels in carp fillets, which was only marginally significant ($p = 0.048$). However, this significance was eliminated when lipid-normalized concentrations were used. Based on the results of this analysis, there appear to be no significant differences between males and females (smallmouth bass or carp) in terms of lipid-normalized PCB concentrations.

A similar analysis of the 1997 fish data was performed including regression analyses of total wet-weight PCB concentrations versus length, weight, and lipid content to evaluate utility of lipid-based 1997 PCB concentrations. Coefficients of determination (r^2) from these regressions are presented in Table 4-3 for carp and smallmouth bass fillets by sampling location. These results show that, in most cases in 1997, lipid content is more strongly correlated with total PCB concentration than are the other parameters. At all locations other than ABSA 11 (near Saugatuck), lipid content accounts for a substantial portion of the PCB concentration variability. This effect was more pronounced in carp samples than in smallmouth bass samples. In most cases, length, and weight, were very weakly correlated with total PCB concentration, with the exception of ABSA 5 (near Plainwell), where length and weight were strongly correlated with PCB concentration, particularly for carp.

4.1.4 Determinants of Snapping Turtle Tissue PCB Concentrations

Factors affecting PCB bioaccumulation in turtles include those related to the availability of PCB within various media (e.g., food items, water, sediment) in the aquatic environment, and those related to certain properties of the turtles, such as life history, behavioral patterns, diet, metabolic rate, and fat (i.e., lipid) content. The utility of lipid-based PCB data for Kalamazoo River snapping turtles was evaluated in a manner similar to that of fish. Regression analyses of total wet weight PCB concentration versus lipid content, length, and weight were performed. Linear regressions were performed separately for muscle-only and whole-body samples at each ABSA. Coefficients of determination (r^2) from these regression analyses, along with the coefficients of variation for wet weight and lipid-normalized PCB concentrations, are presented in Table 4-3. These analyses indicate that the influence of length, weight, and lipid content on PCB concentration varies. Unlike the fish analysis, the data for both turtle muscle-only and turtle whole-body samples fail to show a strong correlation between PCB content and any of these variables (length, weight, and lipid content).

4.1.5 PCB Concentrations in 1993 Fish

PCB were detected in all fish sampled in 1993 with the exception of one white sucker in ABSA 1. The highest detected total wet weight PCB concentration of 17 mg/kg was found in two carp fillet samples, one each from ABSA 5 and ABSA 10. The highest wet weight total PCB concentration found in a bass fillet was 5.8 mg/kg in ABSA 9.

The Michigan Department of Community Health (MDCH) has established a PCB fish advisory for waters in the State of Michigan. For the general population (excluding pregnant women, nursing mothers, and women who plan to have children), when between 11 and 49 percent of the samples exceed 2.0 mg/kg PCB in fish, it is recommended that fish consumption be restricted to one per week. When 50 percent or more of the samples exceed 2.0 mg/kg PCB in fish, a "no consumption" advisory is issued. For pregnant and/or nursing women, and women who plan to have children, the restrictions on consumption are as follows: For concentrations over 0.05 mg/kg PCB, a "one meal per week" advisory is issued; concentrations over 0.2 mg/kg PCB, trigger a "one meal per month" advisory; for concentrations over 1.0 mg/kg PCB, a "six meals per year" advisory is issued; and concentrations over 2.0 mg/kg trigger a "no consumption" advisory. When data is too limited to judge the necessity for an advisory, but where some indication of contamination exists, an advisory is usually not issued, but additional samples are requested. With small sample sizes, a great deal of professional judgment is

required in applying the advisory criteria. Comparisons of reported PCB concentrations in smallmouth bass and carp fillets collected in 1993 in each ABSA with the above advisory levels are shown below (11 fish of each species were captured at each location). An exceedence is defined as a total PCB concentration that is greater than the advisory level.

ABSA	Species	>0.05 mg/kg PCB	>0.2 mg/kg PCB	>1.0 mg/kg PCB	>2.0 mg/kg PCB
1	Smallmouth	10	2	0	0
	bass	11	0	0	0
	Carp				
2	Smallmouth	11	7	0	0
	bass	11	9	2	0
	Carp				
3	Smallmouth	11	11	3	1
	bass	11	11	11	10
	Carp				
4	Smallmouth	11	10	0	0
	bass	11	11	11	10
	Carp				
5	Smallmouth	11	11	10	3
	bass	11	11	11	10
	Carp				
6	Smallmouth	11	11	3	1
	bass	11	11	11	6
	Carp				
7	Smallmouth	11	11	8	1
	bass	11	11	8	6
	Carp				
8	Smallmouth	11	11	10	4
	bass	11	11	11	10
	Carp				
9	Smallmouth	11	11	11	9
	bass	11	10	7	3
	Carp				
10	Smallmouth	11	11	11	5
	bass	11	11	11	10
	Carp				
11	Smallmouth	11	10	0	0
	bass	11	11	11	10
	Carp				

4.1.6 PCB Concentrations in 1997 Fish

PCB were detected in all fish sampled in 1997 with the exception of one smallmouth bass in ABSA 1 and one carp in ABSA 2. The highest detected total wet weight PCB concentration of 17

mg/kg was found in two carp fillet samples, one each from ABSA 5 and ABSA 11. The highest wet weight total PCB concentrations found in a bass fillet in 1997 was 4.3 mg/kg in ABSA 11.

Comparisons of reported PCB concentrations in smallmouth bass and carp collected in 1997 with the MDCH fish advisory levels is shown below for each ABSA:

ABSA	Species	>0.05 mg/kg PCB	>0.2 mg/kg PCB	>1.0 mg/kg PCB	>2.0 mg/kg PCB
1	Smallmouth	4	0	0	0
	bass	7	1	0	0
	Carp				
2	Smallmouth	7	1	0	0
	bass	10	4	0	0
	Carp				
5	Smallmouth	11	9	1	0
	bass	11	11	11	7
	Carp				
9	Smallmouth	11	10	1	0
	bass	11	11	2	0
	Carp				
11	Smallmouth	11	10	2	2
	bass	12	12	9	8
	Carp				

4.1.7 PCB Concentrations in Turtles

PCB were detected in all snapping turtle samples collected from ABSAs 5 and in most snapping turtle samples from ABSAs 1 and 10. In ABSA 10, one muscle only sample had no detectable PCB concentrations and in ABSA 10, one whole-body and one muscle only sample had no detectable PCB concentrations. The two highest reported PCB concentrations were 8.1 mg/kg in a muscle only sample and 7.9 mg/kg in a whole-body sample. These were detected in ABSAs 1 and 10, respectively. The highest concentrations was detected in the reference ABSA while the next highest was detected in ABSA 10 which is located within the Site. These two samples, as well as one additional whole-body sample from ABSA 10, exceed the United States Food and Drug Administration (USFDA) tolerance level of 2.0-mg/kg total wet weight PCB concentration. Table 4-4 shows a similar association with lipids and PCBs, however it is less than what was observed in fish.

4.1.8 PCDD/PCDF Concentrations in Fish and Turtles

To characterize the concentrations of PCDD and PCDF congeners found in Kalamazoo River fish fillet samples and Kalamazoo River turtle samples, the concentration of each PCDD and PCDF congener was multiplied by the toxicity equivalency factor (TEF) used by both USEPA (1989) and MDEQ. This presentation of the data allows for an expression of all PCDDs and PCDFs in terms of 2,3,7,8-TCDD equivalents, as described in USEPA guidance (1989). The TEFs for each congener and the total TCDD-equivalent concentration for bass and carp fillet samples and turtle muscle samples are provided in Tables 4-5 and 4-6.

The highest total TCDD-equivalent concentrations for bass were observed in ABSA 5 (5.7 ng/kg) and ABSA 7 (5.0 ng/kg), at the Plainwell Dam and Otsego Dam sampling locations, respectively. The highest total-TCDD equivalent concentrations for carp were observed in ABSA 4 (23 ng/kg) and ABSA 5 (20 ng/kg), at Mosel Avenue and Plainwell Dam, respectively. The single highest total-TCDD equivalent concentration for turtles was observed in ABSA 5 (5.6 ng/kg) at Plainwell Dam.

The MDCH "trigger" concentration for 2,3,7,8-TCDD (10 ng/kg; Humphrey, 1986) can be used to assess the potential health impacts associated with the PCDD/PCDF concentrations in Kalamazoo River and Kalamazoo River turtles. The MDCH concentration is more conservative than the current USFDA tolerance level of 25 ng/kg for edible portions of fish and shellfish. The MDCH determines the need for fish and turtle consumption advisories at a given location by comparing the predetermined trigger concentration, established by MDCH as protective of human health, to individual concentrations in fish and turtles, and to the mean concentration for a given sample population.

The total TCDD-equivalent concentrations for Kalamazoo River fish and Kalamazoo River turtles presented in Tables 4-5 and 4-6 show that for both smallmouth bass and snapping turtles (maximum concentration of 5.7 ng/kg and 5.6 ng/kg, respectively) all of the samples collected in the Kalamazoo River have concentrations below the MDCH trigger concentration of 10 ng/kg. Two of the eleven carp samples from the Kalamazoo River, with concentrations of 23 ng/kg (ABSA 4) and 20 ng/kg (ABSA 5), exceeded the MDCH trigger concentration.

The samples selected for analysis of TCDD/TCDF had the highest PCB concentration for each ABSA. As illustrated by relationships of heptachlor epoxide and DDT with PCB concentration for the carp fillets (Figures 4-1 and 4-2), fish with higher PCB concentrations are expected to have higher levels of bioaccumulative chlorinated organics than fish with lower PCB levels. The two carp samples with total TCDD-equivalent concentrations greater than the MDCH trigger levels (samples K40095 from ABSA4 and K40361 from ABSA5) contained among the highest concentration of all organic analytes determined for Kalamazoo River fish tissue. This is apparently due to the high lipid content of these fish. The lipid concentrations of these samples are approximately five times the median for carp fillets and both values are in the upper 10 percent of reported lipid data. PCB concentrations for these two samples also are approximately five times the median for other carp fillets, and both are in the upper five percent of all carp samples. Both samples have elevated levels of other analytes (DDT compounds, heptachlor epoxide, and total chlordane) relative to other Kalamazoo River carp samples.

4.1.9 Pesticides in 1993 Fish

The MDCH has established trigger concentrations for dieldrin, DDT (includes DDT degradation products DDD and DDE), heptachlor epoxide (a heptachlor degradation product) and total chlordane (includes gamma- and alpha-chlordane, cis- and trans-nonachlor) of 0.30 mg/kg, 5.0 mg/kg, 0.30 mg/kg, and 0.30 mg/kg, respectively (Humphrey, et al. 1986). These concentrations are identical to the current USFDA tolerance levels for these constituents in edible portions of fish and shellfish.

No smallmouth bass or carp samples exceeded MDCH trigger concentrations for heptachlor epoxide and DDT. Exceedences of the dieldrin trigger concentration were limited to a single

carp fillet (0.31 mg/kg) in ABSA 10. Total chlordane trigger concentrations were exceeded twice in each of the following ABSAs: ABSA 4 (carp fillets of 0.32 mg/kg and 0.33 mg/kg), ABSA 11 (carp fillets of 0.33 mg/kg and 0.47 mg/kg), and ABSA 10 (carp fillets of 0.35 mg/kg and 0.78 mg/kg).

4.1.10 Mercury in 1993 Fish

Mercury was detected in all fish samples collected in 1993 from all ABSAs. The MDCH trigger concentration for mercury is 0.50 mg/kg (Humphrey, et al., 1986). One bass sample (0.89 mg/kg from ABSA 2) exhibited a mercury concentration greater than the trigger concentration of 0.50 mg/kg. This trigger level is nearly identical to a risk-based value that would be calculated using current USEPA (1992) default (i.e. maximum) exposure assumptions that assume lifetime consumption of fish containing mercury at the trigger level concentration. MDCH trigger concentrations apply only to edible portions of fish (i.e. fillets), hence this comparison is not made for the sucker whole-body data.

4.2 Terrestrial Biota Investigation

Results of the terrestrial biota investigation indicate that the highest soil, earthworm, and mouse PCB concentrations were observed in TBSA 3 (upstream of Trowbridge Dam) and TBSA 5 (downstream of Otsego Dam), and the lowest PCB concentrations were observed in TBSA 11 (reference area).

4.2.1 Observed Terrestrial Species Abnormalities

In general, the mice and earthworms collected from the TBSAs were found to have no indications of disease or stress. As previously discussed, field observations reported that several of the mice collected from the TBSAs for analyses were in advanced stages of pregnancy. The only physical anomalies observed were common parasites and one case of enlarged testicles. In general, no physical anomalies were observed for any of the earthworm samples.

4.2.2 PCB Concentrations in Soil, Mice, and Earthworms

PCB were detected in soil samples from all TBSAs sampled (1, 3, 5, 10 and 11). The highest PCB concentrations in soils were found in TBSAs 5 and 3, which are located within the Site. The lowest PCB concentrations in soil were found in the reference location, TBSA 11. Aroclors 1254 and 1260 were quantified in TBSA 1 and Aroclors 1248, 1254, and 1260 were quantified in TBSAs 3, 5, and 10. In TBSA 11, Aroclors 1248 and 1254 were quantified.

PCB were detected in mice samples from TBSAs 1, 3, 5 and 10. All PCB were quantified as Aroclor 1260. No PCB were detected in mice from the reference TBSA 11. TBSA 5 had the highest wet weight total PCB concentrations in mice of all the TBSAs sampled. This is consistent with the higher soil PCB concentration found in TBSA 5.

PCB were detected in all samples collected from TBSAs 1, 3, 5 and 10. No PCB were detected in earthworms from TBSA 11. In TBSA 1, PCB were quantified as Aroclor 1260. In TBSAs 3, 5 and 10, Aroclor 1260 was not quantified but Aroclors 1254 and 1248 were quantified. The highest PCB concentrations in earthworms were found in TBSAs 3 and 5, which is consistent with the higher values of PCB in the soils in these TBSAs.

4.3 Summary and Conclusions

The following conclusions summarize the preliminary findings of the Kalamazoo River biota investigation:

4.3.1 Aquatic Biota

- In 1993, 121 of 121 carp fillets samples and 120 of 121 smallmouth bass fillet samples exceeded the MDCH advisory level (pregnant and/or nursing women and women who plan to have children) for PCB in fish of 0.05 mg/kg. Of those samples, 10 of 11 smallmouth bass and 11 of 11 carp from ABSA 1, the reference location, exceeded the MDCH advisory level of 0.05 mg/kg.
- In 1993, 106 of 121 carp fillets samples and 105 of 121 smallmouth bass fillet samples exceeded the MDCH advisory level (pregnant and/or nursing women and women who plan to have children) for PCB in fish of 0.20 mg/kg. Of those samples, 2 of 11 smallmouth bass from ABSA 1, the reference location, exceeded the MDCH advisory level of 0.20 mg/kg.
- In 1993, 96 of 121 carp fillets samples and 57 of 121 smallmouth bass fillet samples exceeded the MDCH advisory level (pregnant and/or nursing women and women who plan to have children) for PCB in fish of 1.0 mg/kg. None of those exceedences occurred at ABSA 1, the reference location.
- In 1993, 75 of 121 (62%) carp fillets samples and 24 of 121 (20%) smallmouth bass fillet samples exceeded the MDCH general population advisory level for PCB in fish of 2.0 mg/kg. None of those exceedences occurred at ABSA 1, the reference location.
- In 1997, 51 of 56 carp fillet samples and 44 of 55 smallmouth bass fillet samples exceeded the MDCH advisory level (pregnant and/or nursing women and women who plan to have children) for PCB in fish of 0.05 mg/kg. Of those exceedences, 4 of 5 smallmouth bass and 7 of 7 carp from ABSA 1, the reference location, exceeded the MDCH advisory level of 0.05 mg/kg.
- In 1997, 39 of 56 carp fillet samples and 31 of 55 smallmouth bass fillet samples exceeded the MDCH advisory level (pregnant and/or nursing women and women who plan to have children) for PCB in fish of 0.2 mg/kg. Of those exceedences, 1 of 7 carp from ABSA 1, the reference location, exceeded the MDCH advisory level 0.2 mg/kg.
- In 1997, 22 of 56 carp fillet samples and 5 of 55 smallmouth bass fillet samples exceeded the MDCH advisory level (pregnant and/or nursing women and women who plan to have children) for PCB in fish of 1.0 mg/kg. None of those exceedences occurred at ABSA 1, the reference location.
- In 1997, 15 of 56 (27%) carp fillet samples and 2 of 55 (4%) smallmouth bass fillet samples exceeded the MDCH general population advisory level for PCB in fish of 2.0 mg/kg. None of those exceedences occurred at ABSA 1, the reference location.

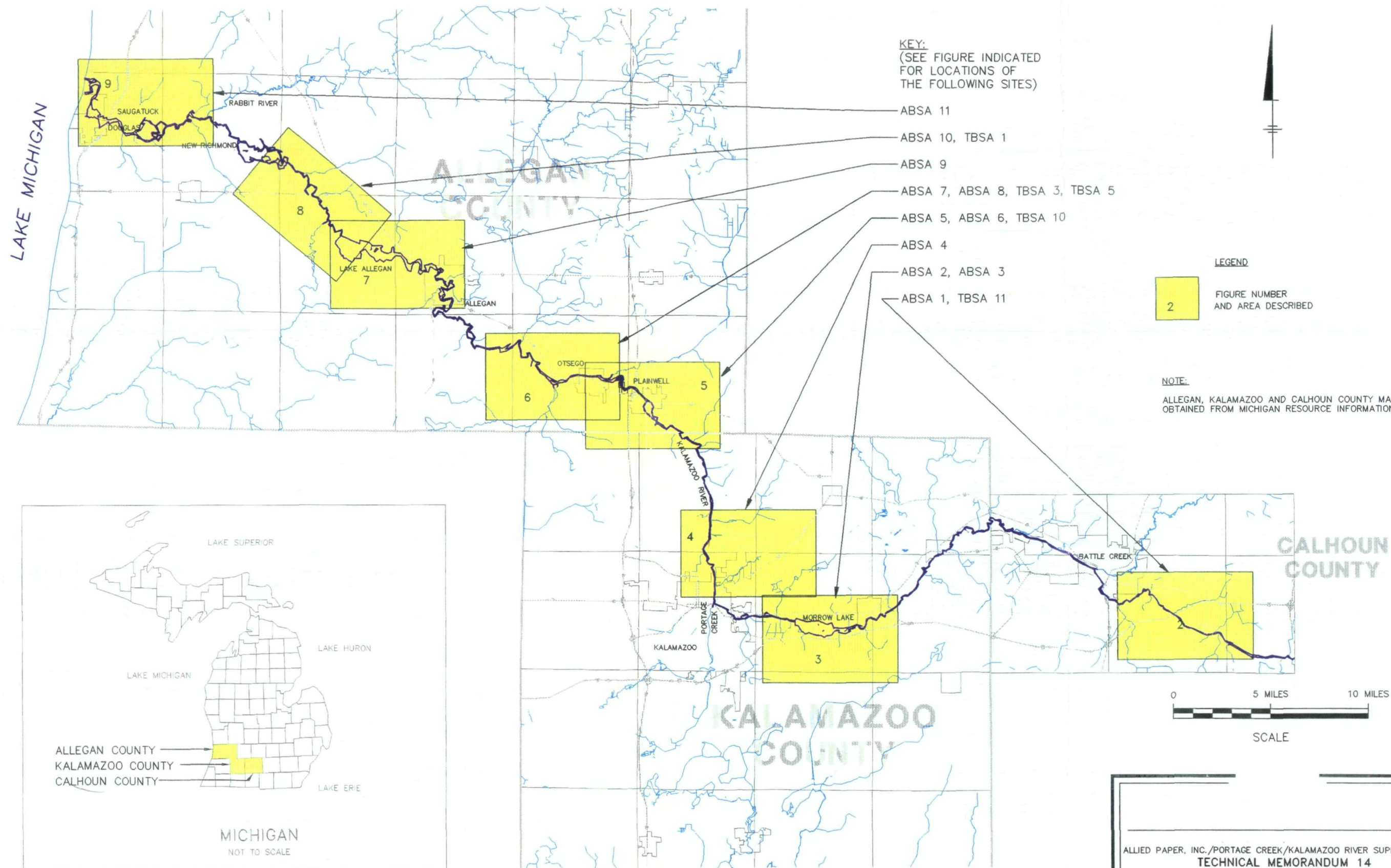
- 3 of the 33 turtle samples collected in 1993 and 1994 exceeded the USFDA tolerance level of 2.0-mg/kg total wet weight PCB concentration. The maximum PCB concentration observed in turtle samples occurred at ABSA 1, the reference location.
- The vast majority of fish and turtles collected from the Kalamazoo River in 1993, 1994 and 1997 were free from external abnormalities;
- Results of statistical analysis performed on both 1993 and 1997 fish data indicate that PCB concentrations in fish are more strongly correlated with percent lipids than with other parameters, including length, weight, and gender.
- The total TCDD-equivalent concentration data for fish and turtles show that for both smallmouth bass and snapping turtles (maximum concentration of 5.7 ng/kg and 5.6 ng/kg, respectively) all of the samples collected in the Kalamazoo River have concentrations below the MDCH trigger concentration of 10 ng/kg.
- Two of the eleven carp samples from the Kalamazoo River, with TCDD-equivalent concentrations of 23 ng/kg (ABSA 4) and 20 ng/kg (ABSA 5), exceeded the MDCH trigger concentration.
- For pesticides, none of the smallmouth bass or carp samples exceeded the MDCH trigger levels for heptachlor epoxide and DDT in fish. A single carp exceeded the MDCH trigger level for dieldrin, and six carp exceeded the trigger level for total chlordane; and
- None of the carp samples and only a single bass specimen had a mercury concentration greater than the MDCH trigger level of 0.50 mg/kg in fish.

4.3.2 Terrestrial Biota

- The highest soil, earthworm, and mouse PCB concentrations were observed in TBSA 3 and TBSA 5, which is included in the Site. The lowest PCB concentrations were observed in TBSA 11; the reference area,
- PCB concentrations in mice tissue were observed in TBSAs 1, 3, 5 and 10, while in the reference area no PCB were detected. The highest concentrations were observed in TBSAs 3 and 5.
- PCB concentrations in earthworm tissue were observed in TBSAs 1, 3, 5, and 10, while in the reference area, no PCB were detected. The highest concentrations were observed in TBSAs 3 and 5.

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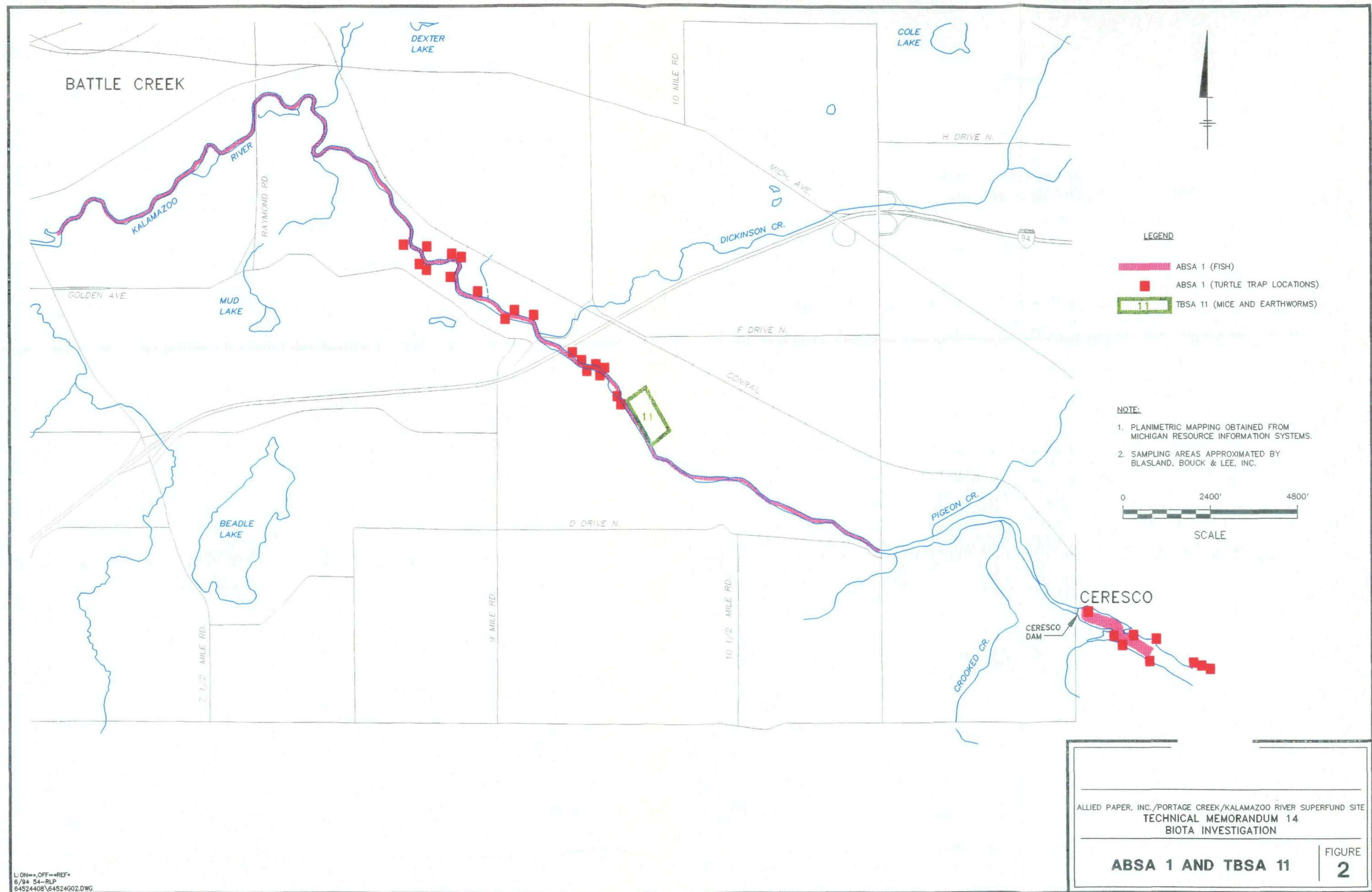
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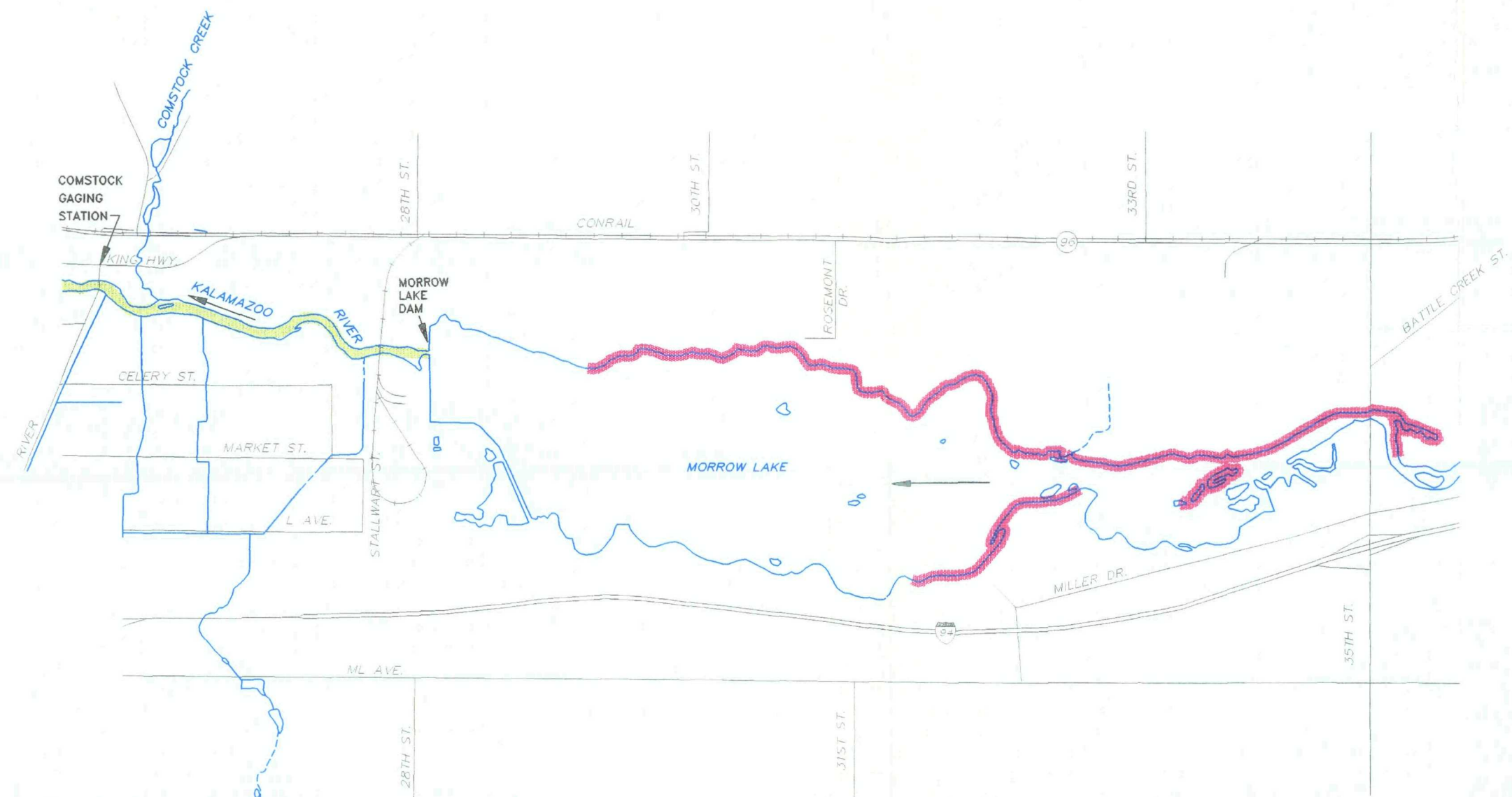


ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE
TECHNICAL MEMORANDUM 14
BIOTA INVESTIGATION

INDEX TO FIGURES

FIGURE
1





LEGEND

- ABSA 2 (FISH)
- ABSA 3 (FISH)

NOTE:

1. PLANIMETRIC MAPPING OBTAINED FROM MICHIGAN RESOURCE INFORMATION SYSTEMS.
2. SAMPLING AREAS APPROXIMATED BY BLASLAND, BOUCK & LEE, INC.

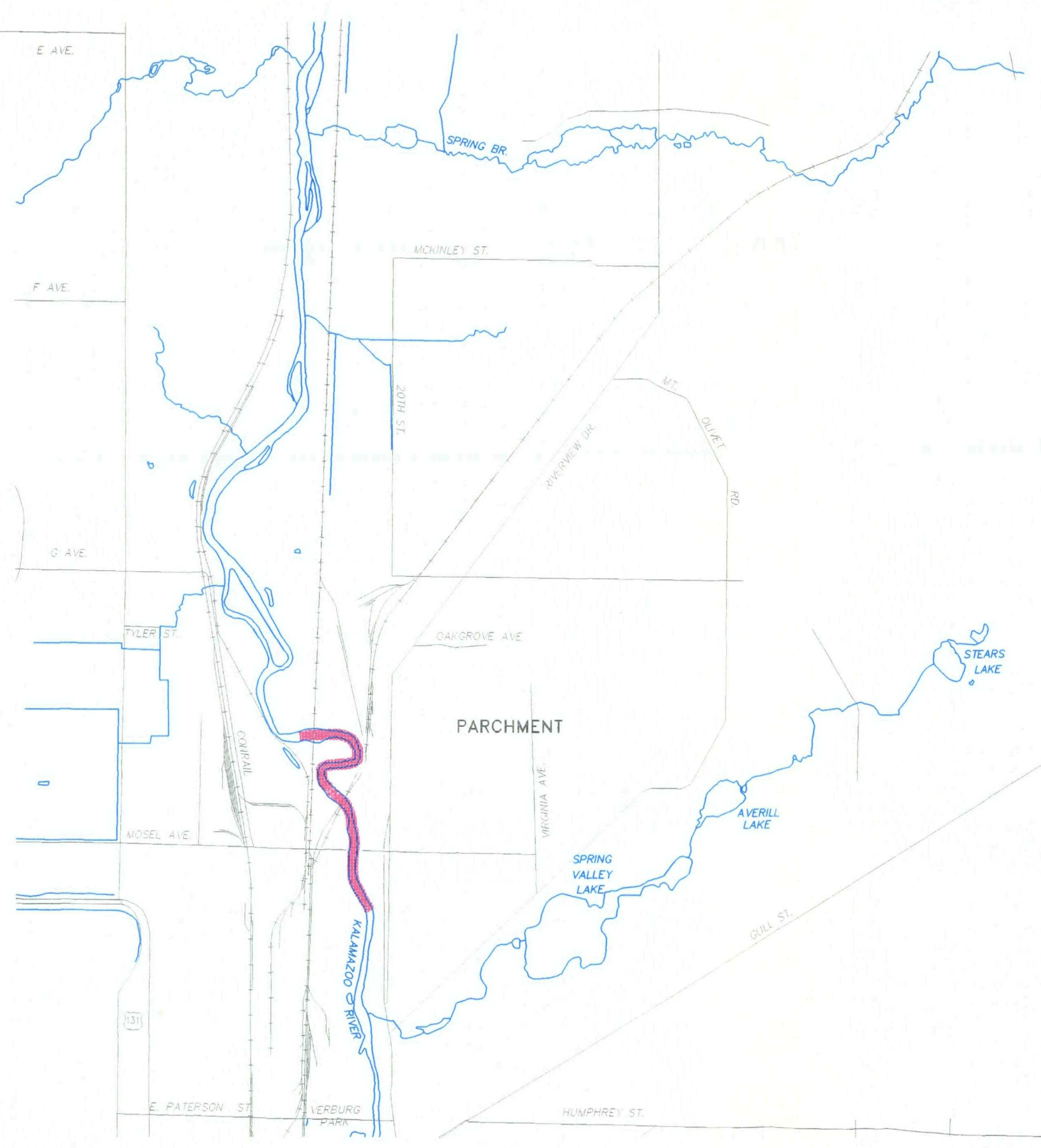


SCALE:

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE
 TECHNICAL MEMORANDUM 14
 BIOTA INVESTIGATION

ABSA 2 AND ABSA 3

FIGURE 3

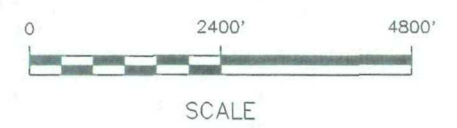


LEGEND

 ABSA 4 (FISH)

NOTE:

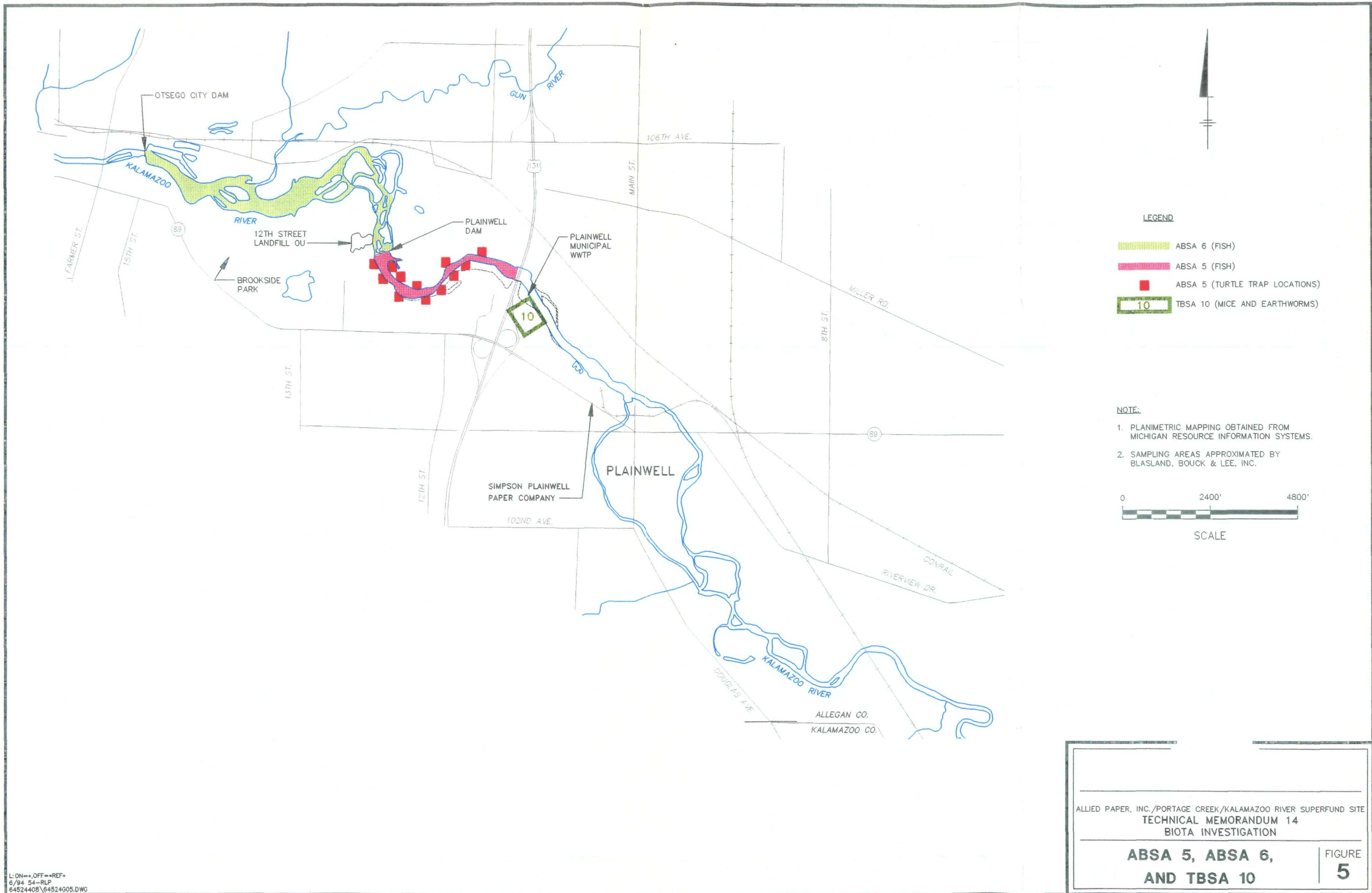
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2. SAMPLING AREAS APPROXIMATED BY BLASLAND, BOUCK & LEE, INC.

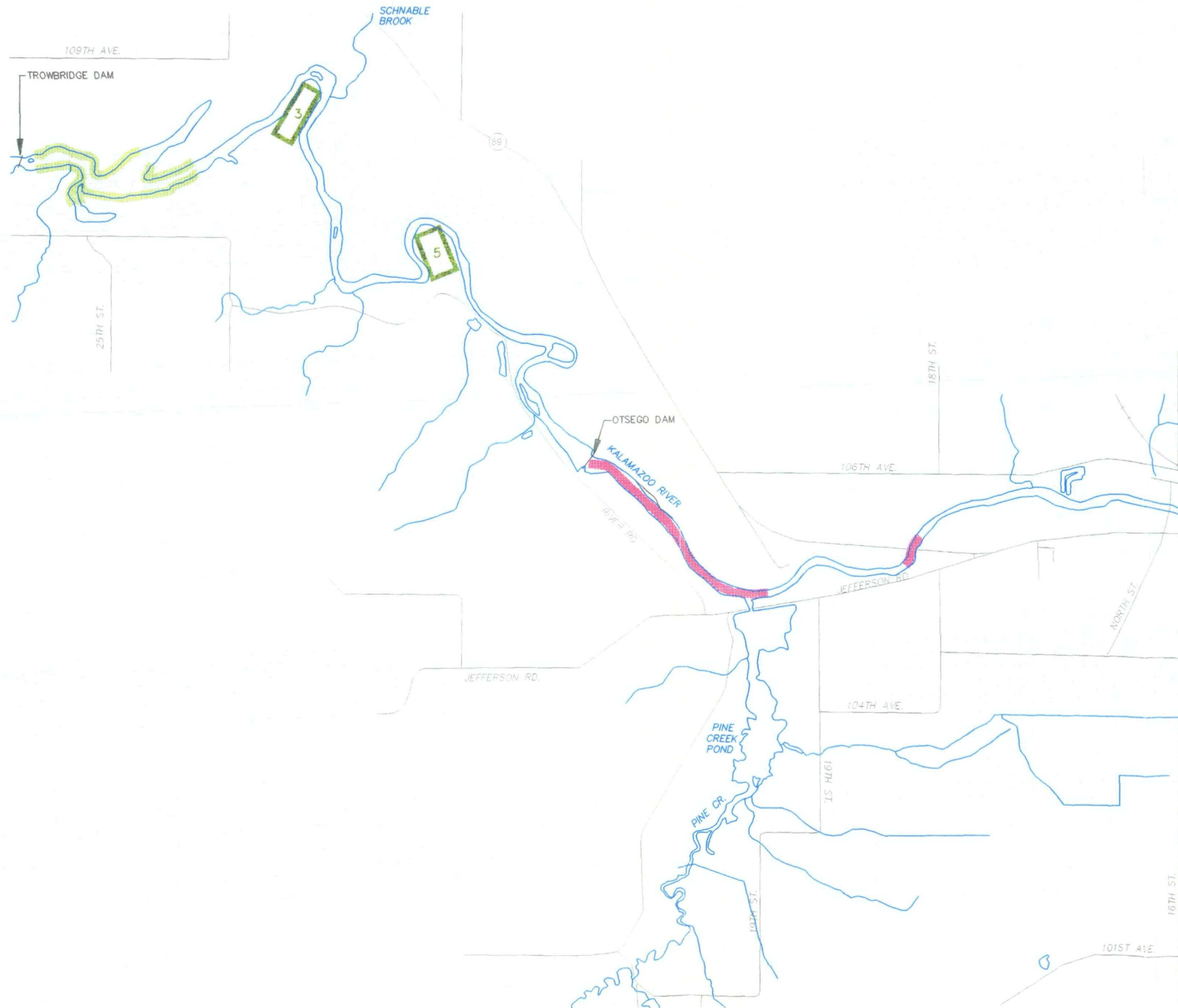


ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE
 TECHNICAL MEMORANDUM 14
 BIOTA INVESTIGATION

ABSA 4

FIGURE
 4





LEGEND

- ABSA 8 (FISH)
- ABSA 7 (FISH)
- 3 TBSA 3 (MICE AND EARTHWORMS)
- 5 TBSA 5 (MICE AND EARTHWORMS)

NOTE:

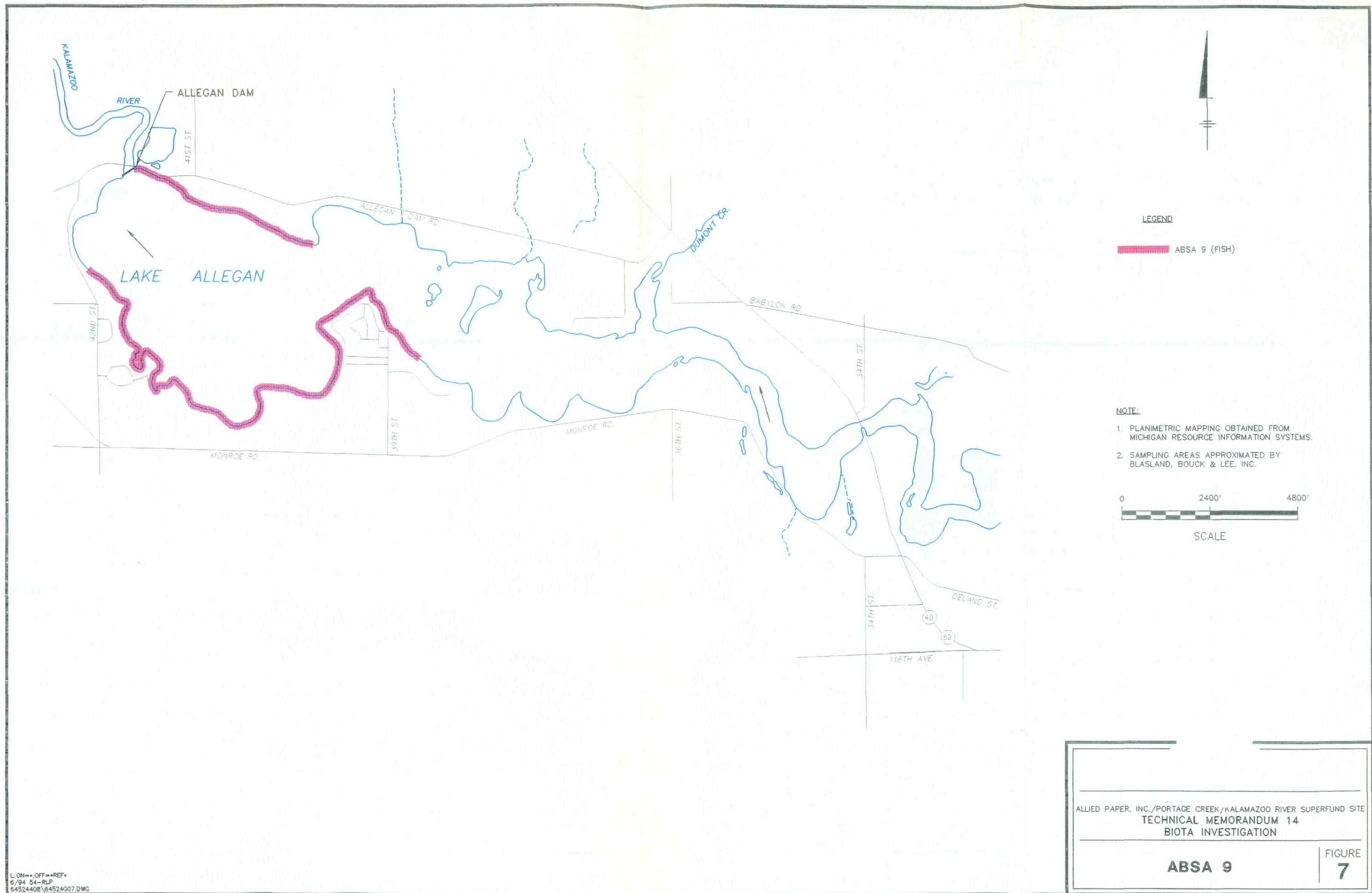
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2. SAMPLING AREAS APPROXIMATED BY BLASLAND, BOUCK & LEE, INC.

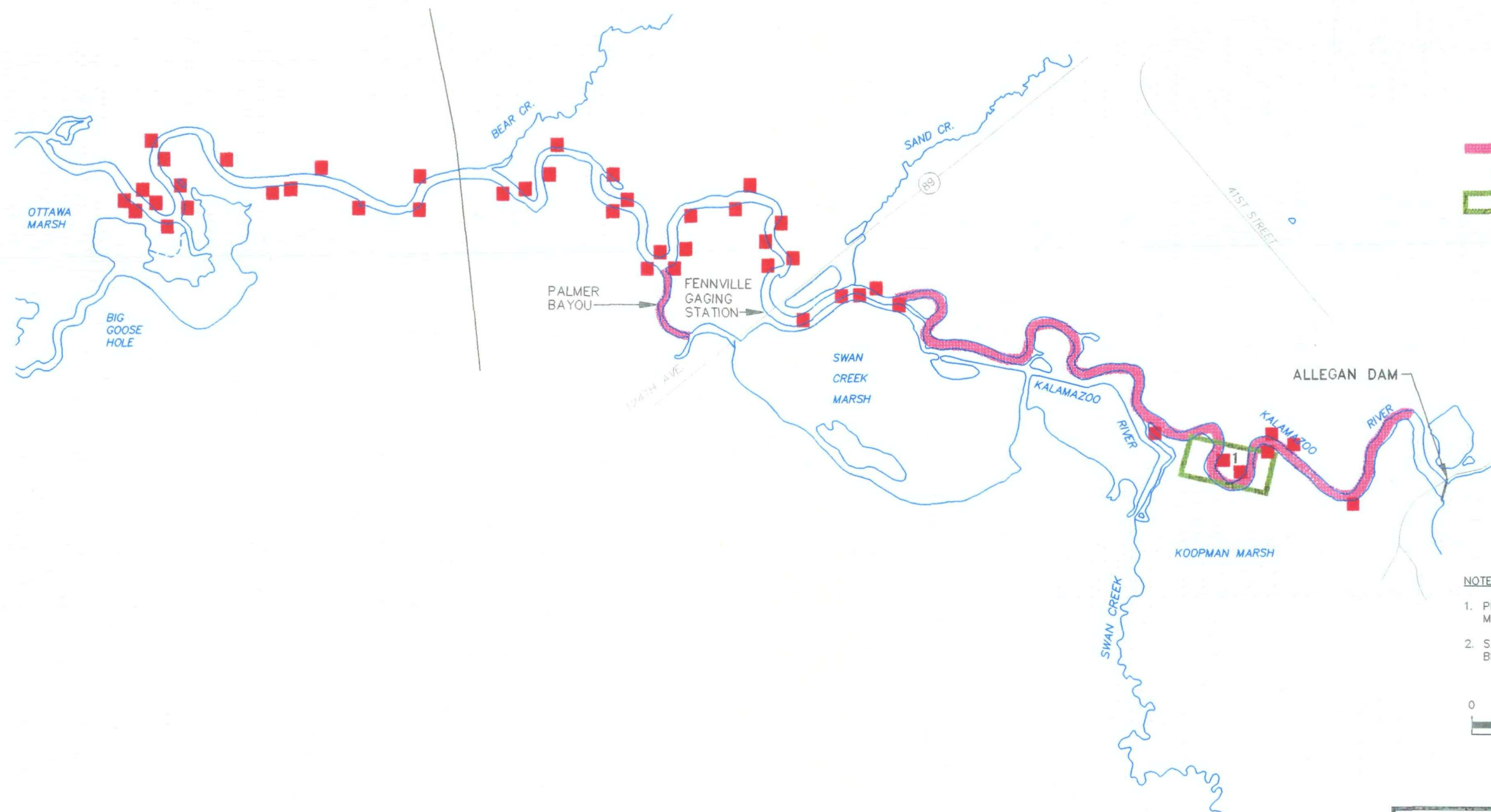


ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE
 TECHNICAL MEMORANDUM 14
 BIOTA INVESTIGATION

**ABSA 7, ABSA 8,
 TBSA 3, AND TBSA 5**

FIGURE
6



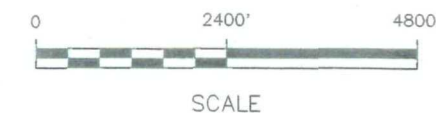


LEGEND

- ABSA 10 (FISH)
- ABSA 10 (TURTLE TRAP LOCATIONS)
- TBSA 1 (MICE AND EARTHWORMS)

NOTE:

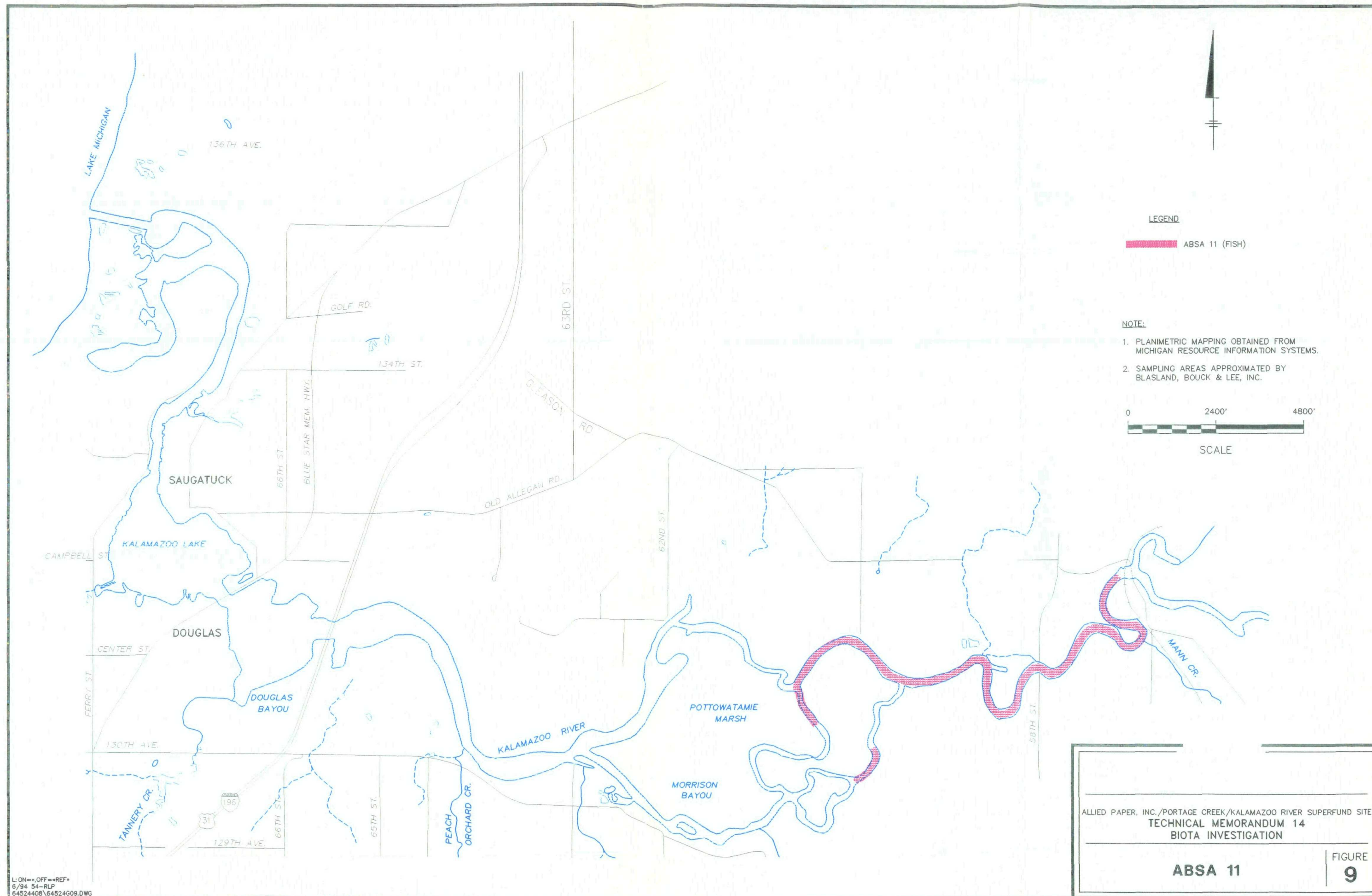
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2. SAMPLING AREAS APPROXIMATED BY BLASLAND, BOUCK & LEE, INC.

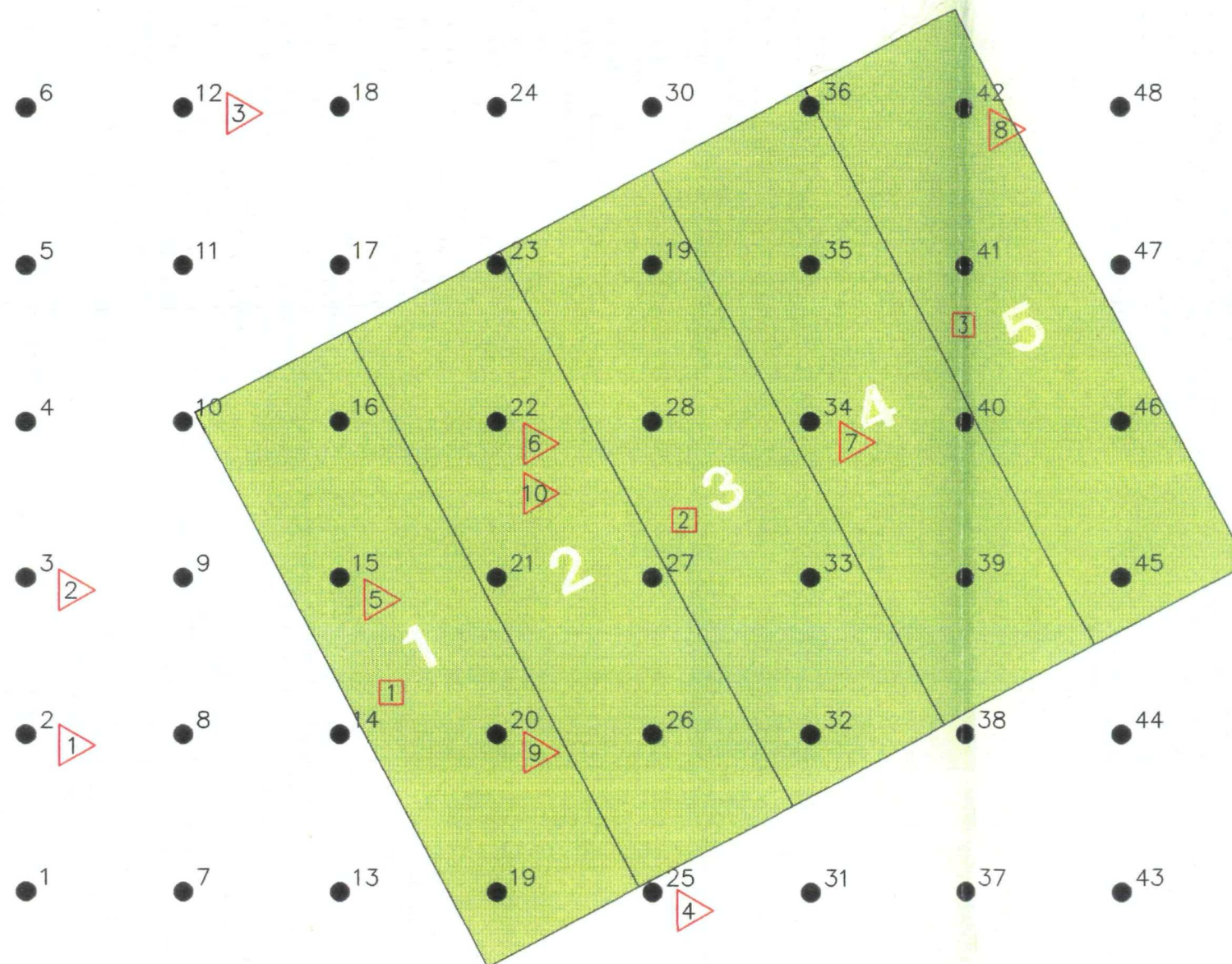


ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE
 TECHNICAL MEMORANDUM 14
 BIOTA INVESTIGATION

ABSA 10 AND TBSA 1

FIGURE
 8





EARTHWORM SAMPLE LOCATIONS

- 1 = K46000
- 2 = K46001
- 3 = K46002

MOUSE SAMPLE LOCATIONS

- | | |
|------------|-------------|
| 1 = K44000 | 6 = K44005 |
| 2 = K44001 | 7 = K44006 |
| 3 = K44002 | 8 = K44007 |
| 4 = K44003 | 9 = K44008 |
| 5 = K44004 | 10 = K44009 |

● = TRAP LOCATIONS

COMPOSITE SOIL SAMPLE LOCATIONS

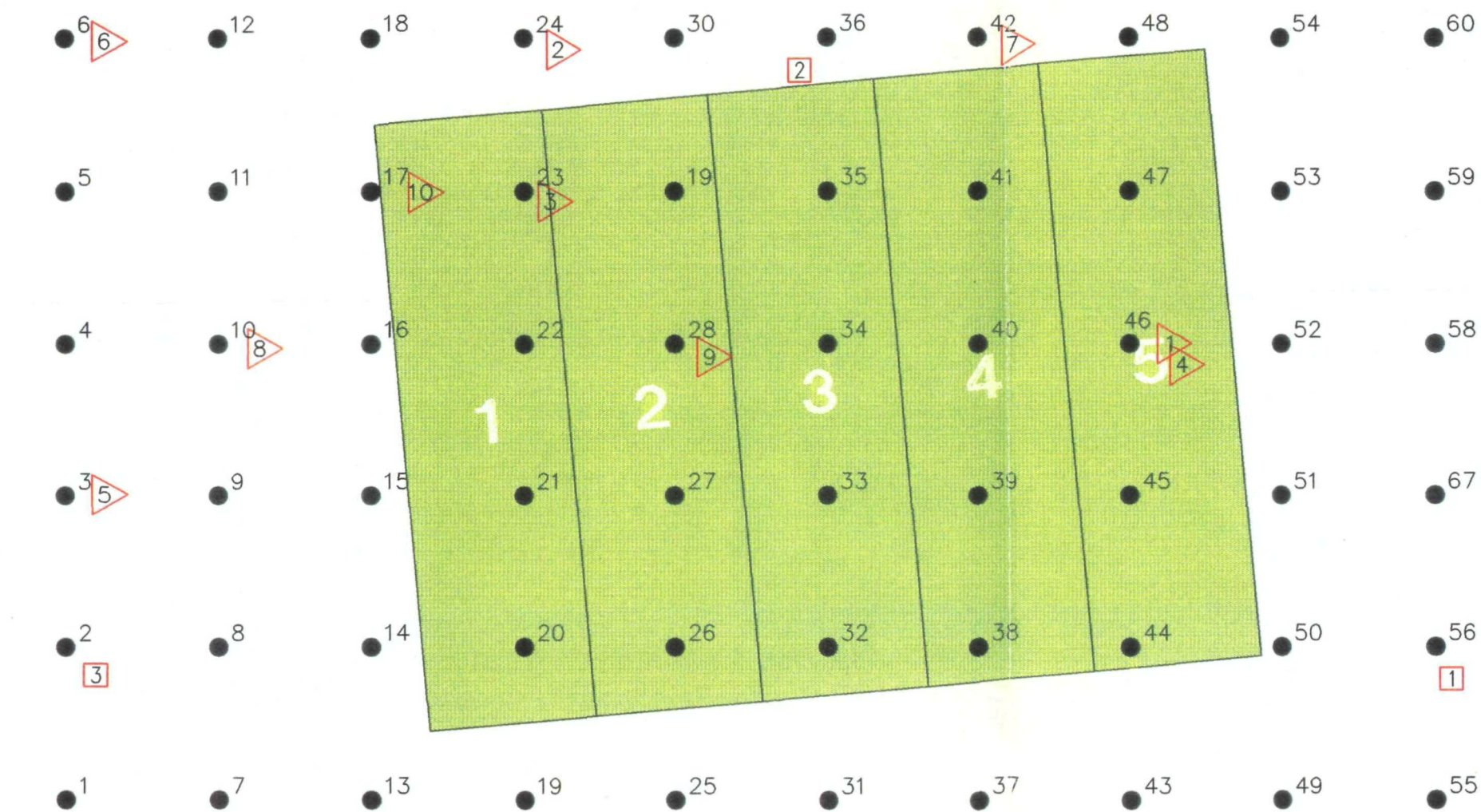
- 1 = SAMPLING GRID LOCATION
TBSA 1-1 THROUGH 1-5

1" = 10 METERS
APPROXIMATE SCALE

KALAMAZOO RIVER

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE
TECHNICAL MEMORANDUM 14
BIOTA INVESTIGATION

TBSA 1 - TERRESTRIAL BIOTA & SOIL SAMPLE LOCATIONS **FIGURE 10**



EARTHWORM SAMPLE LOCATIONS

1 = K46003

2 = K46004

3 = K46005

MOUSE SAMPLE LOCATIONS

1 = K44010

2 = K44011

3 = K44012

4 = K44013

5 = K44014

6 = K44015

7 = K44016

8 = K44017

9 = K44018

10 = K44019

● = TRAP LOCATIONS

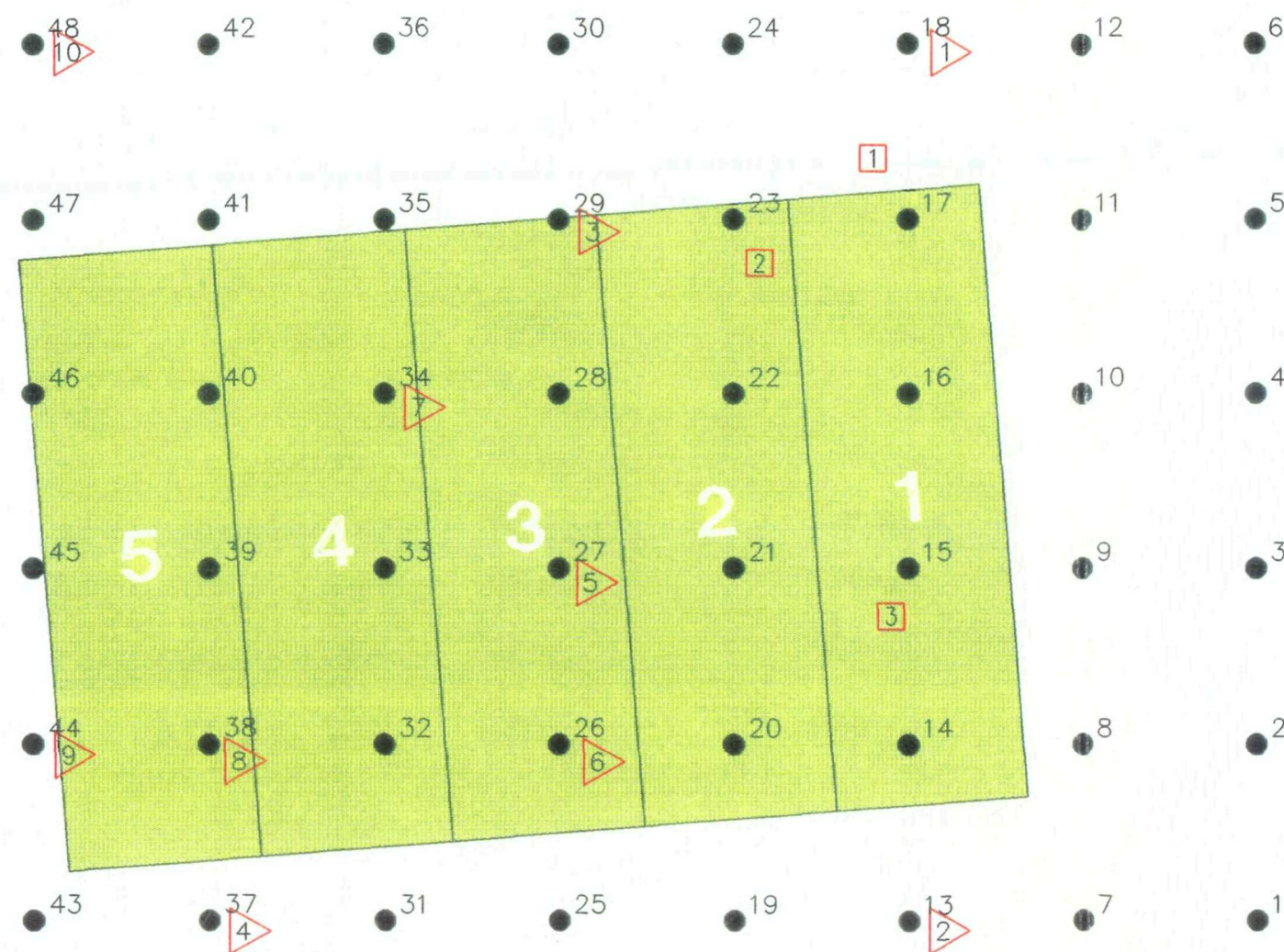
COMPOSITE SOIL SAMPLE LOCATIONS

1 = SAMPLING GRID LOCATION
TBSA 3-1 THROUGH 3-5

1" = 10 METERS
APPROXIMATE SCALE

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE
TECHNICAL MEMORANDUM 14
BIOTA INVESTIGATION

TBSA 3 - TERRESTRIAL BIOTA & SOIL SAMPLE LOCATIONS | FIGURE 11



EARTHWORM SAMPLE LOCATIONS

- 1 = K46006
- 2 = K46007
- 3 = K46008

MOUSE SAMPLE LOCATIONS

- | | |
|--|---|
| 1 = K44020 | 6 = K44025 |
| 2 = K44021 | 7 = K44026 |
| 3 = K44022 | 8 = K44027 |
| 4 = K44023 | 9 = K44028 |
| 5 = K44024 | 10 = K44029 |

● = TRAP LOCATIONS

COMPOSITE SOIL SAMPLE LOCATIONS

- 1 = SAMPLING GRID LOCATION
TBSA 5-1 THROUGH TBSA 5-5

1" = 10 METERS
APPROXIMATE SCALE

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE
TECHNICAL MEMORANDUM 14
BIOTA INVESTIGATION

TBSA 5 - TERRESTRIAL BIOTA & SOIL SAMPLE LOCATIONS **FIGURE 12**



EARTHWORM SAMPLE LOCATIONS

1 = K46012

2 = K46013

3 = K46014

MOUSE SAMPLE LOCATIONS

1 = K44040

2 = K44041

3 = K44042

4 = K44043

5 = K44044

6 = K44045
7 = K44046
8 = K44047
9 = K44048
10 = K44049

● = TRAP LOCATIONS

COMPOSITE SOIL SAMPLE LOCATIONS

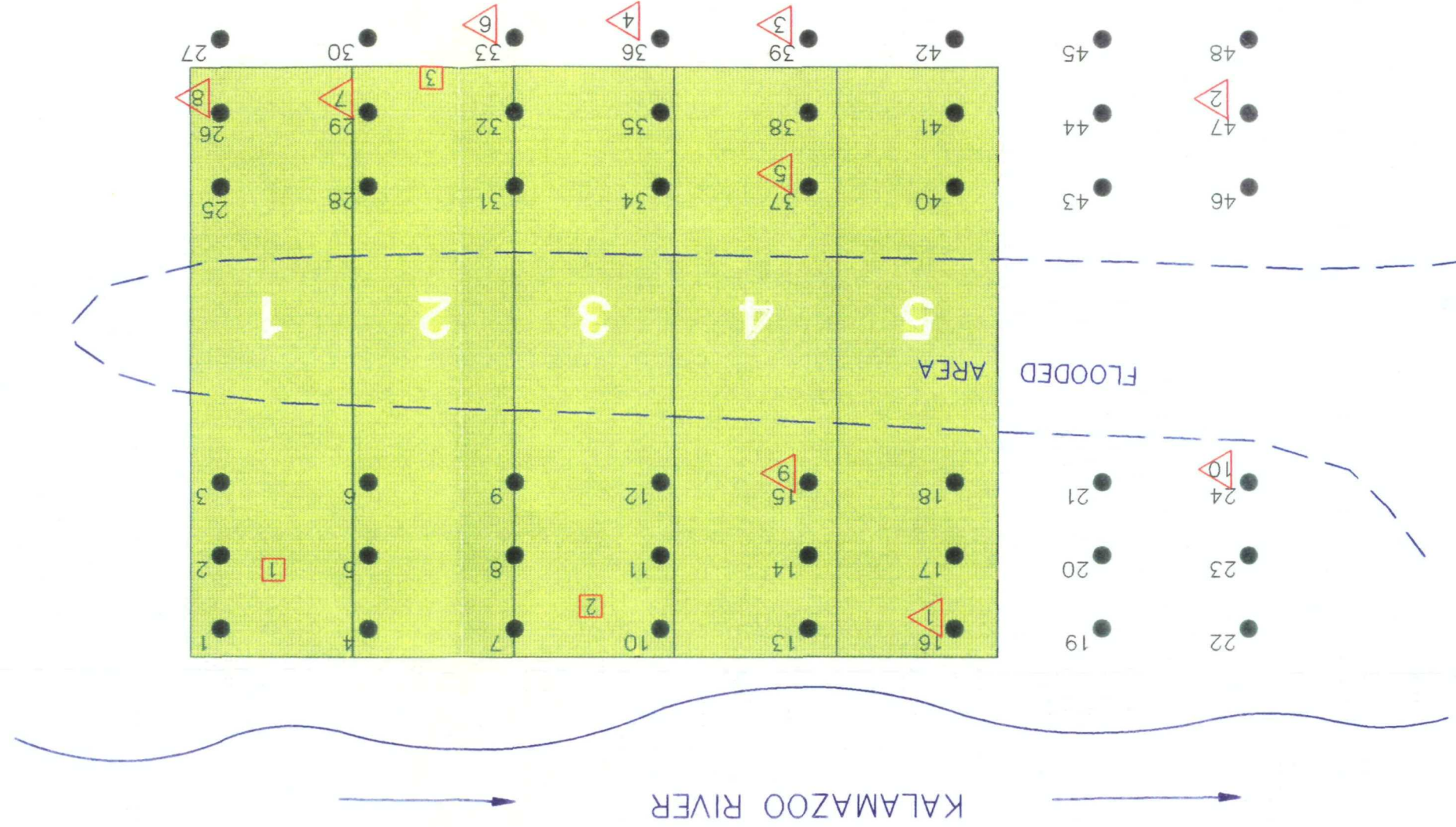
1 = SAMPLING GRID LOCATION

TBSA 10-1 THROUGH TBSA 10-5

1" = 10 METERS
APPROXIMATE SCALE

TBSA 10 - TERRESTRIAL BIOTA
& SOIL SAMPLE LOCATIONS

FIGURE 13
TECHNICAL MEMORANDUM 14
BIOTA INVESTIGATION
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE



EARTHWORM SAMPLE LOCATIONS

- 1 = K46009
- 2 = K46010
- 3 = K46011

MOUSE SAMPLE LOCATIONS

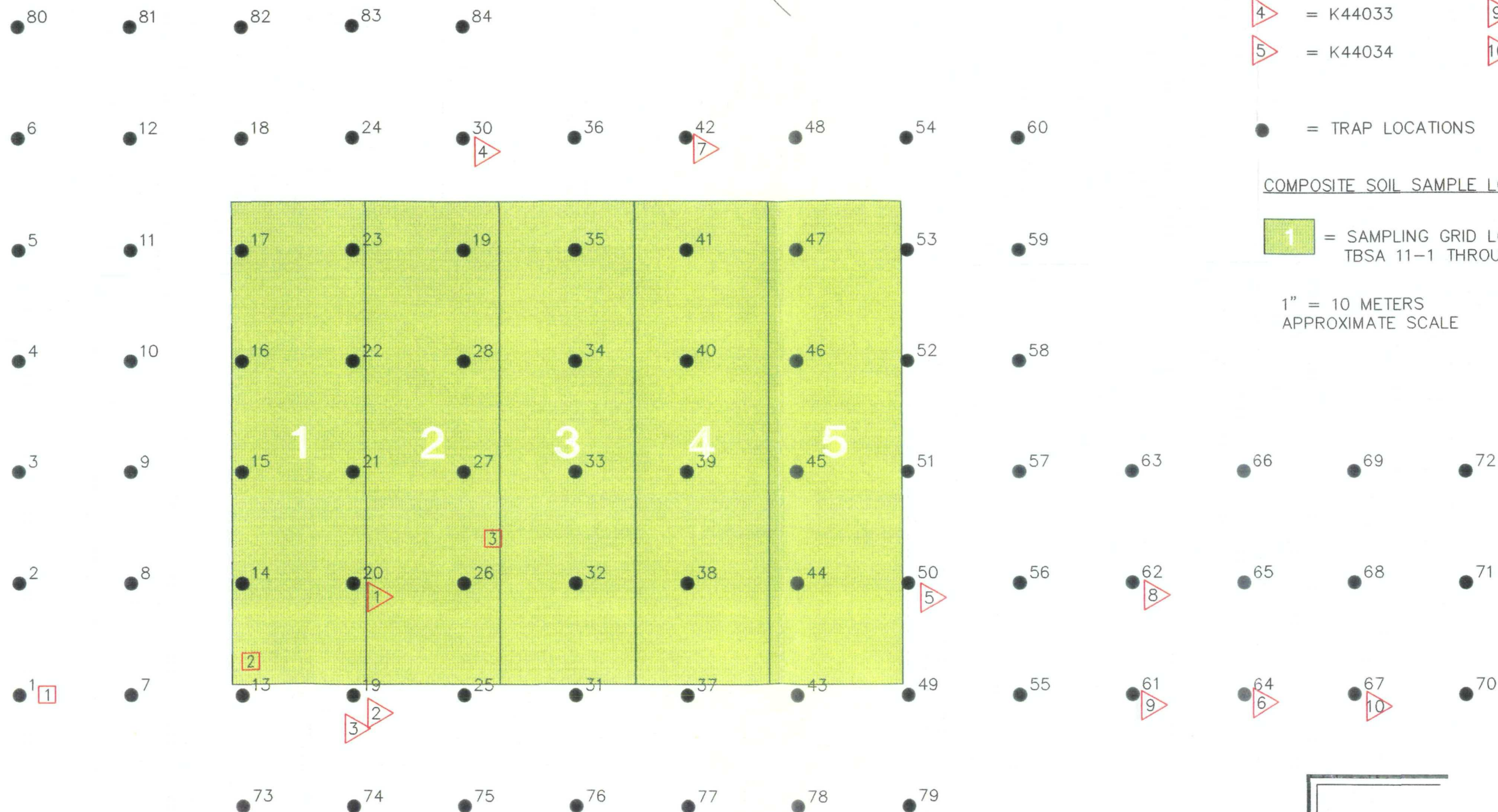
- 1 = K44030
- 2 = K44031
- 3 = K44032
- 4 = K44033
- 5 = K44034
- 6 = K44035
- 7 = K44036
- 8 = K44037
- 9 = K44038
- 10 = K44039

● = TRAP LOCATIONS

COMPOSITE SOIL SAMPLE LOCATIONS

1 = SAMPLING GRID LOCATION
TBSA 11-1 THROUGH 11-5

1" = 10 METERS
APPROXIMATE SCALE



ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE
TECHNICAL MEMORANDUM 14
BIOTA INVESTIGATION

TBSA 11 - TERRESTRIAL BIOTA & SOIL SAMPLE LOCATIONS | FIGURE 14

TABLE 3-1

ALLIED PAPER, INC./PORTAGE CREEK KALAMAZOO
SUPERFUND SITE

BIOTA INVESTIGATION
AQUATIC SAMPLING LOCATIONS AND FISH SPECIES COLLECTED AT EACH LOCATION

Location	Sampling Location	Fish Species ¹					
		Game Fish	Size Range (cm)	Rough Fish	Size Range (cm)	Forage Fish	Size Range (cm)
ABSA 1 ⁴	Kalamazoo River near I-94 upstream city of Battle Creek	Smallmouth Bass ²	>25	Carp 6 Fish 5 Fish	45-55 ≥ 58	White Sucker	15-30
ABSA 2	Morrow Lake	Smallmouth Bass	>25	Carp 4 Fish 7 Fish	45-56 ≥ 58	Golden Redhorse Sucker ³	13-16
ABSA 3	Kalamazoo River downstream of Morrow Dam	Smallmouth Bass ²	>25	Carp 6 Fish 5 Fish	45-55 ≥ 58	Northern Hog Sucker ³	15-30
ABSA 4	Kalamazoo River near Mosel Avenue	Smallmouth Bass	>25	Carp 5 Fish 6 Fish	45-56 ≥ 58	Golden Redhorse Sucker ³	15-30
ABSA 5 ⁴	Kalamazoo River just upstream of Plainwell Dam	Smallmouth Bass	>25	Carp 6 Fish 5 Fish	45-55 ≥ 58	Golden Redhorse Sucker ³	15-30
ABSA 6	Kalamazoo River just upstream of Otsego City Dam	Smallmouth Bass	>25	Carp 7 Fish 4 Fish	45-57 ≥ 58	Golden Redhorse Sucker ³	15-30
ABSA 7	Kalamazoo River just upstream of Otsego Dam	Smallmouth Bass	>25	Carp 6 Fish 5 Fish	45-55 ≥ 58	Golden Redhorse Sucker ³	15-30
ABSA 8	Kalamazoo River just upstream of Trowbridge Dam	Smallmouth Bass	>25	Carp 6 Fish 5 Fish	45-56 ≥ 58	White Sucker	15-30
ABSA 9	Lake Allegan	Smallmouth Bass ²	>25	Carp 11 Fish	44-48	White Sucker	15-30
ABSA 10 ⁴	Kalamazoo River downstream of Allegan Dam	Smallmouth Bass	>25	Carp 5 Fish 6 Fish	45-55 ≥ 58	Spotted Sucker ³	15-30
ABSA 11	Kalamazoo River near Saugatuck	Smallmouth Bass	>25	Carp 6 Fish 5 Fish	45-55 ≥ 58	White Sucker	15-30

Notes:¹ Sample size for all fish and turtle samples was 11 individuals.² Smallmouth bass substituted at this location for walleye.³ Alternative sucker species substituted at this location for white sucker.⁴ Turtle sampling locations.

TABLE 3-2

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
1993 FISH FIELD DATA
ABSA 1

Sample Number	Species	Gender	Length (cm)	Weight (g)
K40421	Carp	Female	65	3200
K40422	Carp	Female	59	2800
K40423	Carp	Female	59	3000
K40424	Carp	Female	61	2900
K40425	Carp	Female	59	2600
K40426	Carp	Female	55	2200
K40427	Carp	Male	51	1700
K40428	Carp	Male	54	1800
K40429	Carp	Female	54	2200
K40430	Carp	Male	55	2100
K40431	Carp	Female	53	2200
Mean			57	2400
SD			4.1	500
K40239	Smallmouth Bass	Female	38	1000
K40240	Smallmouth Bass	Male	40	1000
K40241	Smallmouth Bass	Male	38	900
K40242	Smallmouth Bass	Female	41	1000
K40243	Smallmouth Bass	Female	36	800
K40244	Smallmouth Bass	Male	36	740
K40245	Smallmouth Bass	Female	38	800
K40246	Smallmouth Bass	Female	37	900
K40247	Smallmouth Bass	Male	35	800
K40248	Smallmouth Bass	Female	33	660
K40249	Smallmouth Bass	Female	30	470
Mean			37	820
SD			3.1	160
K40228	White Sucker	Female	28	220
K40229	White Sucker	Male	26	170
K40230	White Sucker	Male	24	150
K40231	White Sucker	Male	26	170
K40232	White Sucker	Male	29	280
K40233	White Sucker	Male	30	320
K40234	White Sucker	Male	18	53
K40235	White Sucker	Male	18	55
K40236	White Sucker	Male	16	35
K40237	White Sucker	Male	18	45
K40238	White Sucker	Female	18	55
Mean			23	140
SD			5.3	100

Notes:

SD - Standard deviation.

TABLE 3-3

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
1993 FISH FIELD DATA
ABSA 2

Sample Number	Species	Gender	Length (cm)	Weight (g)
K40001	Carp	Female	66	3400
K40002	Carp	Female	70	5200
K40003	Carp	Female	58	2500
K40004	Carp	Female	59	2200
K40005	Carp	Female	54	1900
K40006	Carp	Female	56	2300
K40007	Carp	Female	70	4600
K40008	Carp	Female	76	6500
K40009	Carp	Female	69	4600
K40010	Carp	Female	52	1400
K40011	Carp	Female	52	1300
Mean			62	3300
SD			8.4	1700
K40012	Smallmouth Bass	Female	46	1100
K40013	Smallmouth Bass	Female	39	900
K40014	Smallmouth Bass	Male	35	540
K40015	Smallmouth Bass	Male	32	390
K40025	Smallmouth Bass	Female	39	690
K40026	Smallmouth Bass	Female	36	570
K40027	Smallmouth Bass	Female	34	420
K40387	Smallmouth Bass	Female	32	460
K40388	Smallmouth Bass	Female	31	430
K40389	Smallmouth Bass	Male	29	300
K40390	Smallmouth Bass	Male	29	320
Mean			35	560
SD			5.1	250
K40016	Golden Redhorse	Male	15	37
K40017	Golden Redhorse	Male	13	26
K40018	Golden Redhorse	Male	16	44
K40019	Golden Redhorse	Male	16	39
K40020	Golden Redhorse	Male	14	29
K40021	Golden Redhorse	Female	16	52
K40022	Golden Redhorse	Male	13	25
K40023	Golden Redhorse	Male	14	28
K40024	Golden Redhorse	Male	14	29
K40032	Golden Redhorse	Male	14	29
K40033	Golden Redhorse	Male	13	24
Mean			14	33
SD			1.2	8.9

Note:

SD - Standard deviation.

TABLE 3-4

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
1993 FISH FIELD DATA
ABSA 3

Sample Number	Species	Gender	Length (cm)	Weight (g)
K40034	Carp	Male	59	2900
K40035	Carp	Female	63	3100
K40036	Carp	Female	65	4000
K40037	Carp	Female	55	2000
K40038	Carp	Female	59	2100
K40039	Carp	Female	59	2700
K40040	Carp	Male	51	1600
K40041	Carp	Female	51	1800
K40042	Carp	Female	48	1500
K40043	Carp	Male	54	1800
K40044	Carp	Male	53	1800
Mean			56	2300
SD			5.3	780
K40045	Smallmouth Bass	Male	40	730
K40046	Smallmouth Bass	Female	37	640
K40047	Smallmouth Bass	Male	34	500
K40048	Smallmouth Bass	Female	37	580
K40049	Smallmouth Bass	Female	34	450
K40050	Smallmouth Bass	Female	33	450
K40051	Smallmouth Bass	Female	30	320
K40052	Smallmouth Bass	Male	31	330
K40053	Smallmouth Bass	Male	29	320
K40054	Smallmouth Bass	Female	31	320
K40055	Smallmouth Bass	Male	31	310
Mean			33	450
SD			3.4	150
K40057	Northern Hogsucker	Female	20	89
K40058	Northern Hogsucker	Male	19	75
K40059	Northern Hogsucker	Male	19	79
K40060	Northern Hogsucker	Male	18	61
K40061	Northern Hogsucker	Male	19	76
K40062	Northern Hogsucker	Female	18	62
K40063	Northern Hogsucker	Male	17	55
K40432	Northern Hogsucker	Male	17	60
K40433	Northern Hogsucker	Male	20	91
K40434	Northern Hogsucker	Male	15	39
K40435	Northern Hogsucker	Male	22	130
Mean			19	74
SD			1.9	24

Notes:

SD - Standard deviation.

TABLE 3-5

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
1993 FISH FIELD DATA
ABSA 4

Sample Number	Species	Gender	Length (cm)	Weight (g)
K40092	Carp	Female	56	2800
K40093	Carp	Female	65	4100
K40094	Carp	Male	65	3700
K40095	Carp	Female	60	3200
K40096	Carp	Female	64	3700
K40097	Carp	Female	58	2800
K40099	Carp	Female	56	2800
K40100	Carp	Female	61	3100
K40101	Carp	Female	56	2700
K40102	Carp	Male	55	2200
K40391	Carp	Male	51	1300
Mean			59	2900
SD			4.6	770
K40103	Smallmouth Bass	Female	34	460
K40104	Smallmouth Bass	Female	32	390
K40105	Smallmouth Bass	Female	31	380
K40106	Smallmouth Bass	Male	31	360
K40107	Smallmouth Bass	Female	31	340
K40108	Smallmouth Bass	Male	43	830
K40109	Smallmouth Bass	Male	33	430
K40110	Smallmouth Bass	Male	37	530
K40111	Smallmouth Bass	Female	33	430
K40112	Smallmouth Bass	Female	31	300
K40113	Smallmouth Bass	Male	31	340
Mean			33	440
SD			3.7	150
K40114	Golden Redhorse	Male	26	220
K40115	Golden Redhorse	Male	26	230
K40116	Golden Redhorse	Male	17	63
K40117	Golden Redhorse	Male	16	54
K40392	Golden Redhorse	Male	21	110
K40393	Golden Redhorse	Female	18	60
K40394	Golden Redhorse	Male	17	50
K40395	Golden Redhorse	Female	17	50
K40396	Golden Redhorse	Male	17	50
K40397	Golden Redhorse	Male	16	40
K40398	Golden Redhorse	Male	16	40
Mean			19	88
SD			3.8	70

Notes:

SD - Standard deviation.

TABLE 3-6

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
1993 FISH FIELD DATA
ABSA 5

Sample Number	Species	Gender	Length (cm)	Weight (g)
K40350	Carp	Male	52	2100
K40359	Carp	Female	60	3200
K40360	Carp	Female	63	3800
K40361	Carp	Female	61	3100
K40362	Carp	Female	62	3100
K40363	Carp	Male	55	2200
K40364	Carp	Male	55	2100
K40365	Carp	Female	58	2600
K40366	Carp	Male	54	2200
K40367	Carp	Female	50	1500
K40368	Carp	Male	52	2100
Mean			57	2500
SD			4.5	670
K40351	Smallmouth Bass	Male	39	810
K40352	Smallmouth Bass	Male	30	290
K40353	Smallmouth Bass	Female	29	290
K40354	Smallmouth Bass	Female	29	310
K40369	Smallmouth Bass	Male	38	790
K40370	Smallmouth Bass	Female	36	640
K40371	Smallmouth Bass	Female	36	620
K40372	Smallmouth Bass	Female	34	540
K40373	Smallmouth Bass	Female	39	810
K40374	Smallmouth Bass	Male	36	610
K40375	Smallmouth Bass	Female	34	510
Mean			35	570
SD			3.8	200
K40376	Golden Redhorse	Male	21	98
K40377	Golden Redhorse	Male	17	58
K40378	Golden Redhorse	Male	18	61
K40379	Golden Redhorse	Female	18	57
K40380	Golden Redhorse	Female	17	50
K40381	Golden Redhorse	Female	16	49
K40382	Golden Redhorse	Male	17	46
K40383	Golden Redhorse	Male	17	44
K40384	Golden Redhorse	Female	16	44
K40385	Golden Redhorse	Male	16	47
K40386	Golden Redhorse	Female	15	37
Mean			17	54
SD			1.6	16

Notes:

SD - Standard deviation.

TABLE 3-6

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
1993 FISH FIELD DATA
ABSA 5

Sample Number	Species	Gender	Length (cm)	Weight (g)
K40350	Carp	Male	52	2100
K40359	Carp	Female	60	3200
K40360	Carp	Female	63	3800
K40361	Carp	Female	61	3100
K40362	Carp	Female	62	3100
K40363	Carp	Male	55	2200
K40364	Carp	Male	55	2100
K40365	Carp	Female	58	2600
K40366	Carp	Male	54	2200
K40367	Carp	Female	50	1500
K40368	Carp	Male	52	2100
Mean			57	2500
SD			4.5	670
K40351	Smallmouth Bass	Male	39	810
K40352	Smallmouth Bass	Male	30	290
K40353	Smallmouth Bass	Female	29	290
K40354	Smallmouth Bass	Female	29	310
K40369	Smallmouth Bass	Male	38	790
K40370	Smallmouth Bass	Female	36	640
K40371	Smallmouth Bass	Female	36	620
K40372	Smallmouth Bass	Female	34	540
K40373	Smallmouth Bass	Female	39	810
K40374	Smallmouth Bass	Male	36	610
K40375	Smallmouth Bass	Female	34	510
Mean			35	570
SD			3.8	200
K40376	Golden Redhorse	Male	21	98
K40377	Golden Redhorse	Male	17	58
K40378	Golden Redhorse	Male	18	61
K40379	Golden Redhorse	Female	18	57
K40380	Golden Redhorse	Female	17	50
K40381	Golden Redhorse	Female	16	49
K40382	Golden Redhorse	Male	17	46
K40383	Golden Redhorse	Male	17	44
K40384	Golden Redhorse	Female	16	44
K40385	Golden Redhorse	Male	16	47
K40386	Golden Redhorse	Female	15	37
Mean			17	54
SD			1.6	16

Notes:

SD - Standard deviation.

TABLE 3-7

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
1993 FISH FIELD DATA
ABSA 6

Sample Number	Species	Gender	Length (cm)	Weight (g)
K40064	Carp	Female	57	2700
K40065	Carp	Male	52	2000
K40066	Carp	Male	49	1500
K40067	Carp	Male	49	1900
K40068	Carp	Male	57	2600
K40069	Carp	Male	51	1600
K40258	Carp	Male	58	2700
K40259	Carp	Female	60	3000
K40260	Carp	Male	59	2900
K40261	Carp	Female	59	2900
K40262	Carp	Male	57	2400
Mean			55	2400
SD			4.2	540
K40070	Smallmouth Bass	Male	37	620
K40071	Smallmouth Bass	Male	36	610
K40072	Smallmouth Bass	Female	32	420
K40073	Smallmouth Bass	Female	31	360
K40074	Smallmouth Bass	Male	28	300
K40252	Smallmouth Bass	Male	32	550
K40253	Smallmouth Bass	Female	34	630
K40254	Smallmouth Bass	Male	36	800
K40255	Smallmouth Bass	Male	39	860
K40256	Smallmouth Bass	Male	42	950
K40257	Smallmouth Bass	Male	34	530
Mean			35	600
SD			3.9	200
K40075	Golden Redhorse	Male	25	190
K40076	Golden Redhorse	Female	26	190
K40077	Golden Redhorse	Male	25	150
K40078	Golden Redhorse	Male	22	110
K40079	Golden Redhorse	Male	25	160
K40080	Golden Redhorse	Female	24	170
K40081	Golden Redhorse	Male	23	150
K40264	Golden Redhorse	Female	24	170
K40265	Golden Redhorse	Female	18	55
K40266	Golden Redhorse	Male	15	35
K40267	Golden Redhorse	Male	15	35
Mean			22	130
SD			4.1	60

Notes:

SD - Standard deviation.

TABLE 3-8

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
1993 FISH FIELD DATA
ABSA 7

Sample Number	Species	Gender	Length (cm)	Weight (g)
K40268	Carp	Female	62	2900
K40269	Carp	Female	64	3600
K40270	Carp	Female	61	3600
K40271	Carp	Female	55	2100
K40272	Carp	Female	49	1500
K40273	Carp	Female	50	1500
K40274	Carp	Female	47	1300
K40275	Carp	Female	49	1700
K40284	Carp	Male	48	1400
K40285	Carp	Female	63	3300
K40286	Carp	Female	58	2400
Mean			55	2300
SD			6.7	910
K40276	Smallmouth Bass	Female	33	400
K40277	Smallmouth Bass	Male	34	500
K40278	Smallmouth Bass	Female	38	700
K40279	Smallmouth Bass	Female	37	600
K40280	Smallmouth Bass	Male	44	1100
K40281	Smallmouth Bass	Female	41	900
K40282	Smallmouth Bass	Male	38	700
K40287	Smallmouth Bass	Male	38	700
K40288	Smallmouth Bass	Male	31	300
K40289	Smallmouth Bass	Female	30	300
K40290	Smallmouth Bass	Female	36	500
Mean			36	610
SD			4.2	250
K40291	Golden Redhorse	Male	30	300
K40292	Golden Redhorse	Female	30	300
K40293	Golden Redhorse	Male	29	200
K40294	Golden Redhorse	Male	30	300
K40295	Golden Redhorse	Female	28	200
K40296	Golden Redhorse	Male	26	200
K40297	Golden Redhorse	Male	27	200
K40298	Golden Redhorse	Male	18	56
K40299	Golden Redhorse	Male	16	36
K40300	Golden Redhorse	Female	16	36
K40301	Golden Redhorse	Male	15	35
Mean			24	170
SD			6.4	110

Notes:

SD - Standard deviation.

TABLE 3-9

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
1993 FISH FIELD DATA
ABSA 8

Sample Number	Species	Gender	Length (cm)	Weight (g)
K40315	Carp	Female	56	2200
K40316	Carp	Female	65	3500
K40317	Carp	Female	69	3800
K40318	Carp	Male	55	2200
K40319	Carp	Female	55	2000
K40320	Carp	Male	48	1500
K40321	Carp	Female	52	1700
K40322	Carp	Female	48	1500
K40325	Carp	Female	62	3100
K40326	Carp	Male	63	2900
K40327	Carp	Female	67	2800
Mean			58	2500
SD			7.4	800
K40302	Smallmouth Bass	Male	33	400
K40303	Smallmouth Bass	Female	38	600
K40304	Smallmouth Bass	Male	35	500
K40305	Smallmouth Bass	Female	35	500
K40306	Smallmouth Bass	Male	34	500
K40307	Smallmouth Bass	Male	31	300
K40308	Smallmouth Bass	Female	30	300
K40309	Smallmouth Bass	Male	33	400
K40310	Smallmouth Bass	Female	30	300
K40323	Smallmouth Bass	Female	38	670
K40324	Smallmouth Bass	Male	32	450
Mean			34	450
SD			2.8	120
K40328	White Sucker	Female	25	150
K40329	White Sucker	Female	26	190
K40330	White Sucker	Female	23	130
K40331	White Sucker	Male	29	260
K40332	White Sucker	Male	21	120
K40333	White Sucker	Male	21	90
K40334	White Sucker	Male	19	70
K40335	White Sucker	Male	20	80
K40336	White Sucker	Male	19	70
K40337	White Sucker	Male	20	80
K40338	White Sucker	Male	19	70
Mean			22	120
SD			3.3	61

Notes:

SD - Standard deviation.

TABLE 3-10

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITEBIOTA INVESTIGATION
1993 FISH FIELD DATA
ABSA 9

Sample Number	Species	Gender	Length (cm)	Weight (g)
K40119	Carp	Female	48	1600
K40120	Carp	Female	46	1100
K40121	Carp	Female	47	1300
K40122	Carp	Female	47	1300
K40123	Carp	Male	44	1100
K40124	Carp	Female	48	1500
K40125	Carp	Male	45	1100
K40126	Carp	Female	48	1000
K40127	Carp	Male	46	1400
K40128	Carp	Male	44	1200
K40129	Carp	Female	45	1100
Mean			46	1200
SD			1.5	190
K40130	Smallmouth Bass	Female	45	1300
K40131	Smallmouth Bass	Female	38	740
K40132	Smallmouth Bass	Female	38	770
K40133	Smallmouth Bass	Female	38	850
K40134	Smallmouth Bass	Male	38	800
K40135	Smallmouth Bass	Male	37	680
K40136	Smallmouth Bass	Male	35	600
K40137	Smallmouth Bass	Female	35	620
K40138	Smallmouth Bass	Male	33	430
K40139	Smallmouth Bass	Male	29	350
K40140	Smallmouth Bass	Female	30	280
Mean			36	670
SD			4.4	280
K40141	White Sucker	Female	20	76
K40142	White Sucker	Male	21	95
K40143	White Sucker	Male	20	81
K40144	White Sucker	Female	20	81
K40145	White Sucker	Female	18	71
K40146	White Sucker	Female	20	82
K40147	White Sucker	Male	20	73
K40148	White Sucker	Female	19	64
K40149	White Sucker	Male	19	63
K40150	White Sucker	Male	18	69
K40151	White Sucker	Male	17	53
Mean			19	73
SD			1.2	11

Notes:

SD - Standard deviation.

TABLE 3-11

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
1993 FISH FIELD DATA
ABSA 10

Sample Number	Species	Gender	Length (cm)	Weight (g)
K40152	Carp	Female	54	2200
K40153	Carp	Female	61	2900
K40154	Carp	Female	58	2800
K40155	Carp	Female	52	2200
K40156	Carp	Female	49	1900
K40157	Carp	Female	52	2100
K40158	Carp	Female	52	1800
K40167	Carp	Male	75	7300
K40168	Carp	Female	85	11000
K40169	Carp	Female	75	8700
K40170	Carp	Female	74	7500
Mean			62	4600
SD			12	3400
K40159	Smallmouth Bass	Female	42	1300
K40160	Smallmouth Bass	Female	37	630
K40161	Smallmouth Bass	Female	41	980
K40162	Smallmouth Bass	Male	34	580
K40163	Smallmouth Bass	Female	35	600
K40164	Smallmouth Bass	Male	31	450
K40165	Smallmouth Bass	Male	31	420
K40166	Smallmouth Bass	Female	31	400
K40171	Smallmouth Bass	Female	41	840
K40172	Smallmouth Bass	Female	37	700
K40173	Smallmouth Bass	Female	33	480
Mean			36	670
SD			4.2	280
K40217	Spotted Sucker	Male	24	140
K40218	Spotted Sucker	Male	23	120
K40219	Spotted Sucker	Male	19	60
K40220	Spotted Sucker	Male	27	230
K40221	Spotted Sucker	Male	27	240
K40222	Spotted Sucker	Male	29	290
K40223	Spotted Sucker	Male	27	230
K40224	Spotted Sucker	Male	27	220
K40225	Spotted Sucker	Male	29	290
K40226	Spotted Sucker	Female	30	360
K40227	Spotted Sucker	Male	30	330
Mean			27	230
SD			3.4	91

Notes:

SD - Standard deviation.

TABLE 3-12

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
1993 FISH FIELD DATA
ABSA 11

Sample Number	Species	Gender	Length (cm)	Weight (g)
K40179	Carp	Male	66	4600
K40180	Carp	Female	76	8500
K40181	Carp	Female	61	3700
K40182	Carp	Female	71	5600
K40183	Carp	Female	62	3700
K40184	Carp	Male	55	2100
K40185	Carp	Male	55	2300
K40186	Carp	Female	51	1800
K40187	Carp	Male	50	1700
K40188	Carp	Male	51	1700
K40189	Carp	Female	48	1700
Mean			59	3400
SD			9.3	2200
K40190	Smallmouth Bass	Male	26	200
K40191	Smallmouth Bass	Male	26	220
K40196	Smallmouth Bass	Male	29	340
K40197	Smallmouth Bass	Male	27	220
K40198	Smallmouth Bass	Female	27	250
K40199	Smallmouth Bass	Female	26	200
K40200	Smallmouth Bass	Male	26	170
K40213	Smallmouth Bass	Male	32	480
K40214	Smallmouth Bass	Male	27	290
K40215	Smallmouth Bass	Female	36	800
K40216	Smallmouth Bass	Male	42	1100
Mean			29	390
SD			5.2	300
K40202	White Sucker	Female	28	220
K40203	White Sucker	Male	27	200
K40204	White Sucker	Female	24	140
K40205	White Sucker	Male	23	110
K40206	White Sucker	Female	24	140
K40207	White Sucker	Male	23	110
K40208	White Sucker	Male	23	110
K40209	White Sucker	Male	23	110
K40210	White Sucker	Male	24	140
K40211	White Sucker	Male	22	110
K40212	White Sucker	Male	21	84
Mean			24	130
SD			2.0	42

Notes:

SD - Standard deviation.

Table 3-13

Allied Paper, Inc./Portage Creek/Kalamazoo River
Superfund Site

Biota Investigation
1997 Fish Field Data
ABSA 1

Sample Number	Gender	Length (cm)	Weight (g)
Carp			
K40640	Male	54.0	2200
K40541	Male	57.5	2600
K40643	Female	60	3000
K40644	Female	59.5	3200
K40645	Female	53	2300
K40646	Female	60	3100
K40647	Male	59	2600
K40648	Male	50	1800
K40649	Female	54.5	2400
K40650	Male	53	2000
K40651	Female	51	2200
Mean		56	2500
Standard Deviation		3.8	460
Smallmouth Bass			
K40623	Female	44	1200
K40624	Male	40.5	1100
K40625	Female	36	740
K40626	Male	39	810
K40627	Female	37	730
K40628	Male	38.5	870
K40635	Male	36.0	740
K40636	Male	39.5	1100
K40637	Female	39.0	1100
K40638	Male	36.5	760
K40639	Male	35.0	650
Mean		38	890
Standard Deviation		2.6	200

Table 3-14

Allied Paper, Inc./Portage Creek/Kalamazoo River
Superfund Site

Biota Investigation
1997 Fish Field Data
ABSA 2

Sample Number	Gender	Length (cm)	Weight (g)
Carp			
K40521	Male	53	2000
K40522	Female	53	2100
K40523	Female	62.5	2600
K40525	Female	54.5	2300
K40526	Female	52.0	1800
K40552	Female	70	5500
K40553	Female	69	3900
K40554	Female	73.0	4900
K40555	Female	51.5	2000
K40556	Male	47.5	1300
K40557	Female	69	4400
Mean		60	3000
Standard Deviation		9.1	1400
Smallmouth Bass			
K40527	Female	33.0	570
K40528	Female	45	1200
K40529	Female	33.5	560
K40558	Female	43	1300
K40559	Female	36.5	650
K40590	Male	33.5	550
K40561	Female	34.5	650
K40562	Female	34.0	490
K40563	Male	33.5	490
K40615	Male	33.0	430
K40617	Male	34	550
Mean		36	680
Standard Deviation		4.1	290

Table 3-15

Allied Paper, Inc./Portage Creek/Kalamazoo River
Superfund Site

Biota Investigation
1997 Fish Field Data
ABSA 5

Sample Number	Gender	Length (cm)	Weight (g)
Carp			
K40584	Female	75	6700
K40585	Female	64	4200
K40586	Female	72	5700
K40587	Male	67	4100
K40588	Male	55	2500
K40589	Female	55	2400
K40591	Female	57.5	2500
K40592	Female	50	1900
K40593	Female	53	2300
K40594	Male	51.5	1900
K40595	Female	71	6500
Mean		61	3700
Standard Deviation		9.0	1900
Smallmouth Bass			
K40596	Male	38	680
K40597	Male	38	630
K40598	Female	35	540
K40599	Female	35.5	600
K40600	Male	39.0	910
K40601	Female	36	650
K40602	Female	37	660
K40603	Male	37.5	650
K40605	Female	36	610
K40606	Female	36.5	670
K40607	Male	35.5	540
Mean		37	650
Standard Deviation		1.2	99

Table 3-16

Allied Paper, Inc./Portage Creek/Kalamazoo River
Superfund Site

Biota Investigation
1997 Fish Field Data
ABSA 9

Sample Number	Gender	Length (cm)	Weight (g)
Carp			
K40535	Female	50.0	1700
K40536	Male	47.5	1100
K40537	Male	46.5	1100
K40538	Female	47.5	1400
K40539	Female	46.5	1300
K40568	Female	53	1800
K40569	Female	48	1700
K40570	Female	47.5	1600
K40571	Male	47.0	1200
K40572	Male	47.5	1200
K40574	Female	48.5	1500
Mean		48	1400
Standard Deviation		1.8	260
Smallmouth Bass			
K40540	Male	37.5	680
K40542	Female	36.0	590
K40575	Male	40.0	710
K40576	Female	41.5	1100
K40577	Female	40	770
K40578	Male	34.5	610
K40579	Male	34.5	490
K40580	Male	34.5	510
K40581	Male	34.0	540
K40582	Male	36.5	650
K40583	Male	37.5	570
Mean		37	660
Standard Deviation		2.6	170

Table 3-17

Allied Paper, Inc./Portage Creek/Kalamazoo River
Superfund Site

Biota Investigation
1997 Fish Field Data
ABSA 11

Sample Number	Gender	Length (cm)	Weight (g)
Carp			
K40505	Male	70	5800
K40506	Female	66	6100
K40507	Female	58	3000
K40508	Female	60	3300
K40509	Female	63	4000
K40511	Female	55	2500
K40512	Male	52	2100
K40513	Male	53.5	1900
K40514	Female	49.5	1700
K40515	Female	50	2200
K40516	Female	51.5	1900
K40543	Female	64	3700
Mean		57	2900
Standard Deviation		5.8	1300
Smallmouth Bass			
K40500	Female	43	1000
K40502	Female	39	850
K40544	Male	41.0	1100
K40545	Female	39.0	1100
K40546	Female	36.5	770
K40547	Male	38.0	880
K40548	Male	35.0	640
K40549	Male	40.5	1200
K40550	Male	33.5	570
K40613	Male	33.5	580
K40614	Male	36.5	760
Mean		38	860
Standard Deviation		3.0	220

TABLE 3-18

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITEBIOTA INVESTIGATION
TURTLE FIELD DATA
ABSA 1

Sample Number	Gender	Length (cm)	Weight (g)
K42015	Male	22	2300
K42016	Female	22	2600
K42017	Male	36	11000
K42018	Male	20	1800
K42019	Male	29	5800
K42022	Female	27	4100
K42023	Male	27	4300
K42024	Female	24	3800
K42025	Female	26	4100
K42026	Male	32	6700
K42027	Male	30	6400
Mean		27	4800
SD		4.8	2600

Notes:

SD - Standard deviation.

TABLE 3-19

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITEBIOTA INVESTIGATION
TURTLE FIELD DATA
ABSA 5

Sample Number	Gender	Length (cm)	Weight (g)
K42001	Male	36	12000
K42002	Male	29	4700
K42003	Female	27	4800
K42004	Male	28	3800
K42005	Male	29	4600
K42006	Male	29	6000
K42007	Male	39	11000
K42008	Female	32	8500
K42009	Female	29	5300
K42010	Female	29	5400
K42030	Male	21	2200
Mean		30	6200
SD		4.7	3000

Notes:

SD - Standard deviation.

TABLE 3-20

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITEBIOTA INVESTIGATION
TURTLE FIELD DATA
ABSA 10

Sample Number	Gender	Length (cm)	Weight (g)
K42011	Female	25	3900
K42012	Male	32	8400
K42014	Female	25	4500
K42020	Male	25	3400
K42021	Male	27	4900
K42028	Male	29	6700
K42029	Female	25	4900
K42031	Male	22	2700
K42032	Male	28	6800
K42033	Male	29	6200
K42034	Female	25	3500
Mean		27	5100
SD		2.8	1800

Notes:

SD - Standard deviation.

TABLE 3-21

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
TERRESTRIAL FIELD DATA
WHITEFOOTED MOUSE

Sample Number	Gender	Length (cm)	Weight (g)
TBSA 1			
K44000	Male	16.2	24.0
K44001	Male	16.5	19.5
K44002	Male	14.5	14.0
K44003	Female	14.5	21.0
K44004	Female	16.7	22.0
K44005	Female	16.6	26.0
K44006	Male	16.2	19.0
K44007	Male	16.0	19.0
K44008	Male	16.5	19.0
K44009	Male	16.6	17.0
Mean		16.0	20.1
SD		0.84	3.4
TBSA 3			
K44010	Male	16.1	19.0
K44011	Male	15.0	21.0
K44012	Female	14.1	14.0
K44013	Female	16.5	17.0
K44014	Male	16.2	18.5
K44015	Male	17.6	24.5
K44016	Male	15.5	16.0
K44017	Female	18.3	31.0
K44018	Male	15.5	18.0
K44019	Male	13.8	16.0
Mean		15.9	19.5
SD		1.4	5.0
TBSA 5			
K44020	Female	15.0	15.0
K44021	Female	17.4	27.0
K44022	Male	16.6	16.0
K44023	Female	16.1	29.5
K44024	Male	16.0	20.5
K44025	Male	17.0	21.5
K44026	Male	16.2	20.0
K44027	Female	16.0	16.0
K44028	Male	15.4	19.5
K44029	Male	14.8	15.5
Mean		16.1	20.1
SD		0.83	4.9

See notes on page 2.

TABLE 3-21

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
TERRESTRIAL FIELD DATA
WHITEFOOTED MOUSE

Sample Number	Gender	Length (cm)	Weight (g)
TBSA 10			
K44040	Male	16.0	19.0
K44041	Male	14.8	16.0
K44042	Female	15.4	18.0
K44043	Male	14.8	16.0
K44044	Female	17.8	21.0
K44045	Male	16.0	14.0
K44046	Male	15.4	19.0
K44047	Male	16.7	19.0
K44048	Female	17.1	23.0
K44049	Male	16.8	18.5
Mean		16.1	18.4
SD		1.0	2.6
TBSA 11			
K44030	Female	17.4	27.0
K44031	Female	15.9	18.0
K44032	Male	16.7	24.0
K44033	Female	15.9	16.5
K44034	Male	16.6	18.0
K44035	Female	18.1	22.5
K44036	Male	15.5	17.0
K44037	Male	13.0	12.0
K44038	Female	13.1	12.0
K44039	Female	15.0	15.0
Mean		15.7	18.2
SD		1.7	5.0

Notes:

SD - Standard deviation.

TABLE 3-22

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF TERRESTRIAL FIELD DATA
EARTHWORMS

Sample Number	Species	Number per Sample	Weight (g)
TBSA 1			
K46000	Lumbricus sp.	67	46.5
K46001	Lumbricus sp.	63	39.2
K46002	Lumbricus sp.	61	49.2
TBSA 3			
K46003	Lumbricus sp.	61	20.3
K46004	Lumbricus sp.	38	39.5
K46005	Lumbricus sp., Allolobophora sp.	47	21.5
TBSA 5			
K46006	Lumbricus sp.	40	18.6
K46007	Lumbricus sp.	26	13.7
K46008	Lumbricus sp.	14	10.6
TBSA 10			
K46012	Lumbricus sp., Aporectodea sp., Dendrobaena sp.	63	20.3
K46013	Lumbricus sp., Aporectodea sp., Dendrobaena sp.	51	27.0
K46014	Lumbricus sp., Aporectodea sp., Dendrobaena sp.	57	24.0
TBSA 11			
K46009	Lumbricus sp.	25	23.4
K46010	Lumbricus sp., Aporectodea sp.	50	24.0
K46011	Lumbricus sp., Aporectodea sp., Dendrobaena sp.	36	26.6

TABLE 3-23

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 1 - FISH

Smallmouth Bass Fillet Samples ²											
Sample Number:	K40239	K40240	K40241	K40242	K40243	K40244	K40245	K40246	K40247	K40248	K40249
Sample Date:	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93
PCB											
Aroclor 1016	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050UJ)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)
Aroclor 1242	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050UJ)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)
Aroclor 1248	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050UJ)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)
Aroclor 1254	0.062	0.20	0.24	0.062	0.049 J	0.11 J	0.069	0.10	0.064	0.079	0.092
Aroclor 1260	0.022 J	0.062	0.069	0.031 J	ND(0.050)	0.037 J	0.029 J	0.038 J	ND(0.050U)	0.027 J	0.039 J
Total PCB	0.084J	0.26	0.31	0.093J	0.049J	0.15J	0.098J	0.14J	0.064	0.11J	0.13J
Pesticide											
trans-Nonachlor	ND(0.0050UJ)	0.0062	0.0069	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)
4,4'-DDE	ND(0.010UJ)	0.058	0.069	0.018	0.012	0.030	0.019	0.027	0.016 JN	0.018	0.022
4,4'-DDD	ND(0.010UJ)	0.016	0.022	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)
TAL											
Total Mercury	0.11 JN*	0.08 JN*	0.12 JN*	0.12 JN*	0.08 JN*	0.08 JN*	0.10 JN*	0.07 JN*	0.08 JN*	0.05 JN	0.03 JN
Smallmouth Bass Remaining Carcass Samples											
Sample Number:	K40239	K40240	K40241	K40242	K40243	K40244	K40245	K40246	K40247	K40248	K40249
Sample Date:	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93
PCB											
Aroclor 1016	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	NA	ND(0.050UJ)	ND(0.050U)	NA	NA	NA	NA
Aroclor 1242	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	NA	ND(0.050UJ)	ND(0.050U)	NA	NA	NA	NA
Aroclor 1248	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	NA	ND(0.050UJ)	ND(0.050U)	NA	NA	NA	NA
Aroclor 1254	0.14	0.45	0.53	0.25	NA	0.19 J	0.30	NA	NA	NA	NA
Aroclor 1260	0.067	0.13	0.14	0.13	NA	0.082 J	0.14	NA	NA	NA	NA
Total PCB	0.21	0.58	0.67	0.38	NA	0.27J	0.44	NA	NA	NA	NA
Pesticide											
2-bromobiphenyl	ND(0.010UJ)	0.13	0.13	0.12	NA	ND(0.010UJ)	0.16	NA	NA	NA	NA
3-bromobiphenyl	ND(0.010UJ)	ND(0.010U)	ND(0.010U)	ND(0.010U)	NA	ND(0.010UJ)	0.012 J	NA	NA	NA	NA
Aldrin	ND(0.0050UJ)	ND(0.0050U)	0.0050 J	ND(0.0050U)	NA	ND(0.0050UJ)	ND(0.0050U)	NA	NA	NA	NA
Heptachlor Epoxide	ND(0.0050UJ)	0.0052	0.0070	ND(0.0050U)	NA	ND(0.0050UJ)	0.0052	NA	NA	NA	NA
trans-Nonachlor	ND(0.0050UJ)	0.010	0.014	0.0061 J	NA	ND(0.0050UJ)	0.0092 J	NA	NA	NA	NA
cis-Nonachlor	ND(0.0050UJ)	0.0069	ND(0.0050U)	ND(0.0050U)	NA	ND(0.0050UJ)	ND(0.0050U)	NA	NA	NA	NA
4,4'-DDE	0.037 J	0.12	0.14	0.074	NA	0.046 J	0.091	NA	NA	NA	NA
4,4'-DDD	ND(0.010UJ)	0.031	0.047	0.022	NA	0.010 J	0.023	NA	NA	NA	NA
TAL											
Total Mercury	0.09 JN*	0.04 JN*	0.10 JN*	0.11 JN*	NA	0.05 JN*	0.08 JN*	NA	NA	NA	NA

See Notes on Page 3.

TABLE 3-23

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 1 - FISH

Carp Fillet Samples ³											
Sample Number:	K40421	K40422	K40423	K40424	K40425	K40426	K40427	K40428	K40429	K40430	K40431
Sample Date:	11/09/93	11/09/93	11/09/93	11/09/93	11/09/93	11/09/93	11/09/93	11/09/93	11/09/93	11/09/93	11/09/93
PCB											
Aroclor 1016	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)
Aroclor 1242	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)
Aroclor 1248	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)
Aroclor 1254	0.028 J	0.061	0.059	0.093	0.047 J	0.030 J	0.033 J	0.090	0.062	0.030 J	0.030 J
Aroclor 1260	0.027 J	0.029 J	0.043 J	0.076	0.036 J	0.025 J	0.025 J	ND(0.050U)	0.039 J	0.025 J	0.027 J
Total PCB	0.055J	0.090J	0.10J	0.17	0.083J	0.055J	0.058J	0.090	0.10J	0.055J	0.057J
Pesticide											
2-bromobiphenyl	ND(0.010U)	ND(0.010U)	ND(0.010UJ)	0.043 J	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)
4,4'-DDE	0.0091	0.017	0.023 J	0.052	0.014	0.012	ND(0.010U)	ND(0.010U)	0.019	0.011	0.012
TAL											
Total Mercury	0.03 JN*	0.05 JN*	0.08 JN*	0.16 JN	0.03 JN	0.08 JN	0.05 JN*	0.05 JN*	0.04 JN	0.08 JN*	0.06 JN
Carp Remaining Carcass Samples											
Sample Number:	K40421	K40422	K40423	K40424	K40425	K40426	K40427	K40428	K40429	K40430	K40431
Sample Date:	11/09/93	11/09/93	11/09/93	11/09/93	11/09/93	11/09/93	11/09/93	11/09/93	11/09/93	11/09/93	11/09/93
PCB											
Aroclor 1016	ND(0.050U)	ND(0.050U)	ND(0.050UJ)	NA	NA	NA	ND(0.050U)	ND(0.050U)	NA	ND(0.050U)	NA
Aroclor 1242	ND(0.050U)	ND(0.050U)	ND(0.050UJ)	NA	NA	NA	ND(0.050U)	ND(0.050U)	NA	ND(0.050U)	NA
Aroclor 1248	ND(0.050U)	ND(0.050U)	ND(0.050UJ)	NA	NA	NA	ND(0.050U)	ND(0.050U)	NA	ND(0.050U)	NA
Aroclor 1254	0.065	0.15	0.087 J	NA	NA	NA	0.071	0.041J	NA	0.10	NA
Aroclor 1260	0.060	0.066	0.061 J	NA	NA	NA	0.042 J	0.021 J	NA	0.090	NA
Total PCB	0.13	0.22	0.15J	NA	NA	NA	0.11J	0.062J	NA	0.19	NA
Pesticide											
2-bromobiphenyl	ND(0.010U)	ND(0.010U)	0.071 J	NA	NA	NA	ND(0.010U)	ND(0.010U)	NA	ND(0.010U)	NA
4,4'-DDE	0.019	0.031	0.035 J	NA	NA	NA	0.013	0.012	NA	0.031	NA
4,4'-DDD	ND(0.010U)	0.014	ND(0.010UJ)	NA	NA	NA	ND(0.010U)	ND(0.010U)	NA	ND(0.010U)	NA
TAL											
Total Mercury	0.05 JN*	0.16 JN*	0.04 JN*	NA	NA	NA	0.04 JN*	0.05 JN*	NA	0.05 JN*	NA

See Notes on Page 3.

TABLE 3-23

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 1 - FISH

White Sucker Whole Body Samples											
Sample Number:	K40228W	K40229W	K40230W	K40231W	K40232W	K40233W	K40234W	K40235W	K40236W	K40237W	K40238W
Sample Date:	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93
PCB											
Aroclor 1016	ND(0.050UJ)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)
Aroclor 1242	ND(0.050UJ)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)
Aroclor 1248	ND(0.050UJ)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)
Aroclor 1254	ND(0.050UJ)	0.056	0.096	0.050	0.11	0.043 J	0.036 J	0.028 J	0.045 J	0.053	0.048 J
Aroclor 1260	ND(0.050UJ)	0.034 J	0.031 J	0.030 J	0.033 J	ND(0.050U)	0.021 J	ND(0.050U)	0.022 J	0.024 J	0.027 J
Total PCB	ND	0.090J	0.13J	0.080J	0.14J	0.043J	0.057J	0.028J	0.067J	0.077J	0.075J
Pesticide											
4,4'-DDE	ND(0.010UJ)	0.015	0.036	0.010	0.041	0.014	ND(0.010U)	ND(0.010U)	ND(0.010U)	0.011	0.012
4,4'-DDD	ND(0.010UJ)	ND(0.010U)	ND(0.010U)	ND(0.010U)	0.018	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)
TAL											
Total Mercury	0.03	0.03	0.02	0.02	0.03	0.05	0.02 B	0.01 B	0.01 B	0.01 B	0.01 B

Notes:

¹ Showing only the results for compounds/analytes detected above the quantitation limit.

² Skin-on, scale-on fillets.

³ Skin-off fillets.

J - The compound/analyte was positively identified; however, the associated numerical value is an estimated concentration only.

N - For PCB and Pesticides, the analysis indicates the presence of a compound for which there is presumptive evidence to make a tentative identification.

For Total Mercury, spiked sample recovery not within control limits.

U - The compound was analyzed for but not detected. The associated value is the compound quantitation limit.

UJ - The compound was not detected above the sample quantitation limit. However, the reported limit is approximate and may or may not represent the actual limit of quantitation.

B - The reported value was obtained from a reading less than the contract required detection limit (CRDL) but greater than or equal to the instrument detection limit (IDL).

* - Duplicate analysis not within control limit.

NA - Sample not analyzed.

ND - Not detected.

TABLE 3-24

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
ABSA 1 - FISH

Smallmouth Bass Samples ¹											
Sample Number:	K40239	K40240	K40241	K40242	K40243	K40244	K40245	K40246	K40247	K40248	K40249
Sample Date:	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93
Field Data											
Gender	Female	Male	Male	Female	Female	Male	Female	Female	Male	Female	Female
Length (cm)	38	40	38	41	36	36	38	37	35	33	30
Whole Body Weight (g)	1000	1000	900	1000	800	740	800	900	800	660	470
Laboratory Data											
Fillet % Lipids	0.90	2.27	2.33	1.48	1.02	1.26	0.96	1.99	0.82	1.46	1.06
Rem. Carc. % Lipids	2.29	4.43	5.12	4.20	6.20	2.19	3.24	7.00	3.90	3.84	3.70
Fillet Weight (g)	358	373	372	404	228	302	269	266.0	240	300	185
Total PCB (mg/kg)											
Fillet	0.084J	0.26	0.31	0.093J	0.049J	0.15J	0.098J	0.14J	0.064	0.11J	0.13J
Remaining Carcass	0.21	0.58	0.67	0.38	NA	0.27J	0.44	NA	NA	NA	NA
Calculated Whole Body	0.20	0.55	0.63	0.35	0.23	0.25	0.40	0.39	0.23	0.20	0.31
Lipid-adjusted PCB (mg/kg-lipid)											
Fillet	9.3	11	13	6.2	4.9	12	10	7.0	7.8	7.3	12
Remaining Carcass	9.1	13	13	9.0	NA	12	14	NA	NA	NA	NA

See notes on page 3.

TABLE 3-24

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
ABSA 1 - FISH

Carp Samples ²											
Sample Number:	K40421	K40422	K40423	K40424	K40425	K40426	K40427	K40428	K40429	K40430	K40431
Sample Date:	11/09/93	11/09/93	11/09/93	11/09/93	11/09/93	11/09/93	11/09/93	11/09/93	11/09/93	11/09/93	11/09/93
Field Data											
Gender	Female	Female	Female	Female	Female	Female	Male	Male	Female	Male	Female
Length (cm)	65	59	59	61	59	55	51	54	54	55	53
Whole Body Weight (g)	3200	2800	3000	2900	2600	2200	1700	1800	2200	2100	2200
Laboratory Data											
Fillet % Lipids	0.81	1.21	1.42	3.19	1.44	1.08	0.46	0.35	1.3	0.77	1.44
Rem. Carc. % Lipids	1.72	2.24	2.37	5.1	3.9	2.8	0.75	1.11	3.1	1.62	5.4
Fillet Weight (g)	527	456	543	409	441	311	308	400	507	496	490
Total PCB (mg/kg)											
Fillet	0.055J	0.090J	0.10J	0.17	0.083J	0.055J	0.058J	0.090	0.10J	0.055J	0.057J
Remaining Carcass	0.13	0.22	0.15J	NA	NA	NA	0.11J	0.062J	NA	0.19	NA
Calculated Whole Body	0.13	0.22	0.15	0.26	0.21	0.13	0.11	0.06	0.21	0.18	0.18
Lipid-adjusted PCB (mg/kg-lipid)											
Fillet	6.8	7.5	7.1	5.3	5.9	5.0	13	26	7.7	7.1	4.1
Remaining Carcass	7.6	9.821429	6.3	NA	NA	NA	15	5.6	NA	12	NA

See notes on page 3.

TABLE 3-24

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
ABSA 1 - FISH

White Sucker Whole Body Samples											
Sample Number:	K40228W	K40229W	K40230W	K40231W	K40232W	K40233W	K40234W	K40235W	K40236W	K40237W	K40238W
Sample Date:	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93	10/10/93
Field Data											
Gender	Female	Male	Male	Male	Male	Male	Male	Male	Male	Male	Female
Length (cm)	28	26	24	26	29	30	18	18	16	18	18
Whole Body Weight (g)	220	170	150	170	280	320	53	55	35	45	55
Laboratory Data											
% Lipids	0.83	0.73	0.86	0.78	1.41	0.80	0.73	0.91	0.72	0.73	0.86
Total PCB (mg/kg)											
	ND	0.090J	0.13J	0.080J	0.14J	0.043J	0.057J	0.028J	0.067J	0.077J	0.075J
Lipid-adjusted PCB (mg/kg-lipid)											
	3.0	12	15	10	10	5.4	7.8	3.1	9.3	11	8.7

Notes:¹ Skin-on, scale-on fillets.² Skin-off fillets.

J - The compound/analyte was positively identified; however, the associated numerical value is an estimated concentration only.

NA - Not analyzed.

ND - Not detected.

TABLE 3-25

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 2 - FISH

Smallmouth Bass Fillet Samples ²											
Sample Number:	K40012	K40013	K40014	K40015	K40025	K40026	K40027	K40387	K40388	K40389	K40390
Sample Date:	08/24/93	08/24/93	08/24/93	08/24/93	08/25/93	08/25/93	08/25/93	10/14/93	10/14/93	10/14/93	10/14/93
PCB											
Aroclor 1016	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.10U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)
Aroclor 1242	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.10U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)
Aroclor 1248	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.10U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)
Aroclor 1254	0.17	0.12	0.093	0.27	0.17	0.53	0.20	0.10	0.10	0.15	0.46
Aroclor 1260	0.076	0.033 J	0.030 J	0.082	0.074	0.14	0.067	0.039 J	ND(0.050U)	0.089	0.097
Total PCB	0.25	0.15J	0.12J	0.35	0.24	0.67	0.27	0.14J	0.10	0.24	0.56
Pesticide											
trans-Nonachlor	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	R	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	0.0057 J
cis-Nonachlor	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	0.0092	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	0.0050 J
4,4'-DDE	0.014	0.016	0.012	0.046	0.020	0.055	0.011	0.016	0.011	0.017	0.056
4,4'-DDD	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	0.013	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)
TAL											
Total Mercury	0.21 JN	0.11 JN	0.10 JN	0.14 JN	0.23 JN	0.07 JN	0.89 JN	0.13 JN*	0.13 JN*	0.09 JN*	0.07 JN*
Carp Fillet Samples ³											
Sample Number:	K40001	K40002	K40003	K40004	K40005	K40006	K40007	K40008	K40009	K40010	K40011
Sample Date:	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93
PCB											
Aroclor 1016	ND(0.10U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.25U)	ND(0.050U)	ND(0.050U)
Aroclor 1242	ND(0.10U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.25U)	ND(0.050U)	ND(0.050U)
Aroclor 1248	ND(0.10U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.25U)	ND(0.050U)	ND(0.050U)
Aroclor 1254	0.91	0.23	0.14	0.16	0.26	0.25	0.16	0.71	1.5	0.055	0.12
Aroclor 1260	0.21	0.19	0.20	0.29	0.37	0.10	0.14	0.29	0.40	0.028 J	0.048 J
Total PCB	1.1	0.42	0.34	0.45	0.63	0.35	0.30	1.0	1.9	0.083J	0.17J
Pesticide											
Aldrin	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	0.012 J	ND(0.0050U)	ND(0.0050U)
gamma-Chlordane	0.0055 JN	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	0.012 JN	ND(0.0050U)	ND(0.0050U)
alpha-Chlordane	0.0051	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	0.012	ND(0.0050U)	ND(0.0050U)
trans-Nonachlor	R	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	0.0058 JN	R	ND(0.0050U)	ND(0.0050U)
cis-Nonachlor	0.013	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	0.010	0.021	ND(0.0050U)	ND(0.0050U)
4,4'-DDE	0.071	0.031	0.025	0.021	0.030	0.014 J	0.018	0.056	0.12	ND(0.010U)	ND(0.010U)
4,4'-DDD	0.030	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	0.018	0.067	ND(0.010U)	ND(0.010U)
TAL											
Total Mercury	0.05	0.10	0.05	0.10	0.08	0.05	0.08	0.06	0.05	0.06	0.12

See notes on page 2.

TABLE J-25

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 2 - FISH

Golden Redhorse Sucker Whole-Body Samples											
Sample Number:	K40016W	K40017W	K40018W	K40019W	K40020W	K40021W	K40022W	K40023W	K40024W	K40032W	K40033W
Sample Date:	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93
PCB											
Aroclor 1016	ND(0.050UJ)	ND(0.14U)	ND(0.050U)	ND(0.050U)	ND(0.054U)	ND(0.050U)	ND(0.050U)	ND(0.15UJ)	ND(0.049U)	ND(0.050U)	ND(0.049U)
Aroclor 1242	ND(0.050UJ)	ND(0.14U)	ND(0.050U)	ND(0.050U)	ND(0.054U)	ND(0.050U)	ND(0.050U)	ND(0.15UJ)	ND(0.049U)	ND(0.050U)	ND(0.049U)
Aroclor 1248	ND(0.050UJ)	ND(0.14U)	ND(0.050U)	ND(0.050U)	ND(0.054U)	ND(0.050U)	ND(0.050U)	ND(0.15UJ)	ND(0.049U)	ND(0.050U)	ND(0.049U)
Aroclor 1254	0.55 J	0.44	0.48	0.54	0.30	0.49	0.17	0.71 J	0.28	0.65	0.46
Aroclor 1260	0.080 J	ND(0.14U)	0.22	0.059	0.16	0.057	0.068	0.085 J	0.056	ND(0.050U)	0.054
Total PCB	0.63J	0.44	0.70	0.60	0.46	0.55	0.24	0.80J	0.34	0.65	0.51
Pesticide											
gamma-BHC	ND(0.0050U)	ND(0.015U)	ND(0.0050U)	ND(0.0050U)	ND(0.0055U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	0.0053 JN	ND(0.0050UJ)
Aldrin	ND(0.0050U)	ND(0.015U)	0.0071 J	0.0074	ND(0.0055U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050UJ)
Heptachlor Epoxide	R	ND(0.015U)	R	R	ND(0.0055U)	R	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	0.0066	ND(0.0050UJ)
gamma-Chlordane	ND(0.0050U)	ND(0.015U)	0.0064 JN	0.0056 JN	ND(0.0055U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	0.0052 JN	ND(0.0050UJ)
alpha-Chlordane	ND(0.0050U)	ND(0.015U)	0.0055	ND(0.0050U)	ND(0.0055U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050UJ)
cis-Nonachlor	ND(0.0050U)	ND(0.015U)	0.0077	0.0062	ND(0.0055U)	0.0051	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050UJ)
4,4'-DDE	0.029 J	0.011 J	0.038 J	0.040 J	0.020	0.029 J	0.030	ND(0.010U)	0.031	0.029 JN	0.019 JN
4,4'-DDD	0.011	ND(0.029U)	0.020	0.018 J	ND(0.011U)	ND(0.010U)	0.014	ND(0.010U)	0.015	0.016	ND(0.010UJ)
TAL											
Total Mercury	0.01 BJN	0.01 BJN	0.01 BJN	0.01 BJN	0.01 BJN	0.01 BJN	0.02 BJN	0.01 BJN	0.02 BJN	0.01 BJN	0.01 BJN

Notes:

¹ Showing only the results for compounds/analytes detected above the quantitation limit.

² Skin-on, scale-on fillets.

³ Skin-off fillets.

J - The compound/analyte was positively identified; however, the associated numerical value is an estimated concentration only.

R - The sample results were rejected.

U - The compound was analyzed for but not detected. The associated value is the compound quantitation limit.

UJ - The compound was not detected above the sample quantitation limit. However, the reported limit is approximate and may or may not represent the actual limit of quantitation.

B - The reported value was obtained from a reading less than the contract required detection limit (CRDL) but greater than or equal to the instrument detection limit (IDL).

N - For PCB and Pesticides, the analysis indicates the presence of a compound for which there is presumptive evidence to make a tentative identification.

For Total Mercury, spiked sample recovery not within control limits.

* - Duplicate analysis not within control limit.

NA - Sample not analyzed.

ND - Not detected.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
ABSA 2 - FISH

Smallmouth Bass Samples ¹											
Sample Number:	K40012	K40013	K40014	K40015	K40025	K40026	K40027	K40387	K40388	K40389	K40390
Sample Date:	08/24/93	08/24/93	08/24/93	08/24/93	08/25/93	08/25/93	08/25/93	10/14/93	10/14/93	10/14/93	10/14/93
Field Data											
Gender	Female	Female	Male	Male	Female	Female	Female	Female	Female	Male	Male
Length (cm)	46	39	35	32	39	36	34	32	31	29	29
Whole Body Weight (g)	1100	900	540	390	690	570	420	460	430	300	320
Laboratory Data											
Fillet % Lipids	0.47	1.52	0.67	0.79	0.62	1.90	0.44	0.55	0.49	0.58	1.41
Rem. Carc. % Lipids	2.90	7.30	2.20	3.90	0.94	5.90	2.00	2.05	2.54	1.00	3.05
Fillet Weight (g)	453	359	212	173	264	273	170	142	133	103	111
Total PCB (mg/kg)											
Fillet	0.25	0.15J	0.12J	0.35	0.24	0.67	0.27	0.14J	0.10	0.24	0.56
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calculated Whole Body	1.0	0.50	0.29	1.1	0.32	1.4	0.84	0.41	0.39	0.36	1.0
Lipid-adjusted PCB (mg/kg-lipid)											
Fillet	53	10	18	44	39	35	61	25	20	41	40
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carp Samples ²											
Sample Number:	K40001	K40002	K40003	K40004	K40005	K40006	K40007	K40008	K40009	K40010	K40011
Sample Date:	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93
Field Data											
Gender	Female	Female	Female	Female	Female	Female	Female	Female	Female	Female	Female
Length (cm)	66	70	58	59	54	56	70	76	69	52	52
Whole Body Weight (g)	3400	5200	2500	2200	1900	2300	4600	6500	4600	1400	1300
Laboratory Data											
Fillet % Lipids	1.05	0.95	1.07	0.40	0.86	0.67	0.69	1.31	4.24	0.16	0.22
Rem. Carc. % Lipids	2.70	2.40	2.40	0.68	3.10	1.50	2.70	1.80	9.50	0.65	0.61
Fillet Weight (g)	715	847	555	420	453	498	894	1306	974	277	245
Total PCB (mg/kg)											
Fillet	1.1	0.42	0.34	0.45	0.63	0.35	0.30	1.0	1.9	0.083J	0.17
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calculated Whole Body	2.4	0.96	0.65	0.70	1.9	0.69	1.0	1.3	3.8	0.29	0.41
Lipid-adjusted PCB (mg/kg-lipid)											
Fillet	100	44	31	110	73	52	43	77	45	52	77
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

See notes on page 2.

TABLE J-26

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
ABSA 2 - FISH

Golden Redhorse Whole Body Samples											
Sample Number:	K40016W	K40017W	K40018W	K40019W	K40020W	K40021W	K40022W	K40023W	K40024W	K40032W	K40033W
Sample Date:	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93	08/24/93
Field Data											
Gender	Male	Male	Male	Male	Male	Female	Male	Male	Male	Male	Male
Length (cm)	15	13	16	16	14	16	13	14	14	14	13
Whole Body Weight (g)	37	26	44	39	29	52	25	28	29	29	24
Laboratory Data (mg/kg)											
% Lipids	2.52	1.25	3.27	2.71	2.00	2.05	2.63	2.30	3.51	3.98	2.88
Total PCB (mg/kg)											
	0.63J	0.44	0.70	0.60	0.46	0.55	0.24	0.80J	0.34	0.65	0.51
Lipid-adjusted PCB (mg/kg-lipid)											
	25	34	21	22	23	26	9.2	35	9.7	16	18

Notes:¹ Skin-on, scale-on fillets.² Skin-off fillets.

J - The compound/analyte was positively identified; however, the associated numerical value is an estimated concentration only.

NA - Not analyzed.

TABLE 3-27

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 3 - FISH

Smallmouth Bass Fillet Samples ²											
Sample Number:	K40045	K40046	K40047	K40048	K40049	K40050	K40051	K40052	K40053	K40054	K40055
Sample Date:	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93
PCB											
Aroclor 1016	ND(0.25U)	ND(0.10U)	ND(0.10U)	ND(0.10U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.10U)	ND(0.10U)
Aroclor 1242	ND(0.25U)	ND(0.10U)	ND(0.10U)	ND(0.10U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.10U)	ND(0.10U)
Aroclor 1248	ND(0.25U)	ND(0.10U)	ND(0.10U)	ND(0.10U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.10U)	ND(0.10U)
Aroclor 1254	2.8	0.85	1.2	1.4	0.65	0.51	0.69	0.32	0.36	0.70	0.65
Aroclor 1260	0.43	0.14	0.19	0.31	0.099	0.098	0.13	0.064	0.056	0.19	0.10
Total PCB	3.2	0.99	1.4	1.7	0.75	0.61	0.82	0.38	0.42	0.89	0.75
Pesticide											
Aldrin	R	R	0.0076 JN	0.0076 JN	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)
Dieldrin	R	ND(0.010U)	0.012 JN	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)
Heptachlor Epoxide	0.022	0.0083	0.011	0.012	0.0050	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	R	0.0051
alpha-Chlordane	0.0074	ND(0.0050U)	ND(0.0050U)	0.0060	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)
trans-Nonachlor	R	ND(0.0050U)	R	0.028 J	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)
cis-Nonachlor	0.022 JN	0.0098	0.014	0.017 J	0.0074 J	0.0058 JN	0.0076 J	ND(0.0050U)	ND(0.0050U)	0.0091 J	0.0084
4,4'-DDE	0.15	0.049	0.076	0.100	0.038	0.029 J	0.045	0.019 J	0.022	0.045	0.038
4,4'-DDD	0.026	ND(0.010U)	R	0.017	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)
TAL											
Total Mercury	0.07 JN	0.07 JN	0.08 JN	0.10 JN	0.08 JN	0.07 JN	0.05 JN	0.05 JN	0.06 JN	0.04 JN	0.05 JN
Carp Fillet Samples ³											
Sample Number:	K40034	K40035	K40036	K40037	K40038	K40039	K40040	K40041	K40042	K40043	K40044
Sample Date:	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93
PCB											
Aroclor 1016	ND(0.50U)	ND(0.10U)	ND(0.50U)	ND(0.25U)	ND(0.25U)	ND(0.50U)	ND(0.25U)	ND(0.25U)	ND(0.25U)	ND(0.50U)	ND(0.50U)
Aroclor 1242	ND(0.50U)	ND(0.10U)	ND(0.50U)	ND(0.25U)	ND(0.25U)	ND(0.50U)	ND(0.25U)	ND(0.25U)	ND(0.25U)	ND(0.50U)	ND(0.50U)
Aroclor 1248	ND(0.50U)	ND(0.10U)	ND(0.50U)	ND(0.25U)	ND(0.25U)	ND(0.50U)	ND(0.25U)	ND(0.25U)	ND(0.25U)	ND(0.50U)	ND(0.50U)
Aroclor 1254	5.9	1.0	7.1	2.7	3.1	6.2	3.5	3.1	2.9	2.0	2.9
Aroclor 1260	1.6	0.40	1.1	0.34	1.0	1.1	0.76	0.30	0.35	0.72	0.61
Total PCB	7.5	1.4	8.2	3.0	4.1	7.3	4.3	3.4	3.3	2.7	3.5
Pesticide											
gamma-BHC	0.0061 J	ND(0.0050U)	ND(0.015U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.0050U)	ND(0.010U)	ND(0.0050U)	ND(0.0050U)	ND(0.010U)
Aldrin	0.020 JN	0.011 JN	0.042 JN	0.022 JN	0.015 JN	0.032 J	R	0.040 J	0.019 J	0.0087 JN	0.020 JN
Dieldrin	R	ND(0.010U)	R	ND(0.020U)	ND(0.020U)	R	0.030 JN	R	R	ND(0.010U)	ND(0.020U)
Heptachlor Epoxide	0.016	ND(0.0050U)	0.026	0.020 J	ND(0.010U)	0.022 J	ND(0.0050U)	0.037	0.023	0.0075	0.016
gamma-Chlordane	0.030 JN	R	ND(0.015U)	0.019 JN	R	0.037 JN	0.016 JN	0.029 JN	0.018 JN	0.012 JN	0.023 JN
alpha-Chlordane	0.011 J	ND(0.0050U)	0.019	0.011	ND(0.010U)	0.019	ND(0.0050U)	0.022	0.014	ND(0.0050U)	0.012
cis-Nonachlor	0.047 JN	0.014 J	0.091	0.034	0.043	0.077	0.032	0.037	0.031	ND(0.0050U)	0.034 J
4,4'-DDE	0.18 DJ	0.053	0.36	0.22	0.19 J	0.29	0.15	0.21	0.14 J	0.13	0.17 J
4,4'-DDD	0.058	0.012	0.090	0.054	0.033	0.085	0.026	0.086	0.043	0.021	0.057
TAL											
Total Mercury	0.08	0.14	0.10	0.03	0.12	0.06	0.10	0.04	0.05	0.12	0.09

See notes on page 2.

TABLE 3-27

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 3 - FISH

Northern Hog Sucker Whole Body Samples											
Sample Number: Sample Date:	K40057W 08/26/93	K40058W 08/26/93	K40059W 08/26/93	K40060W 08/26/93	K40061W 08/26/93	K40062W 08/26/93	K40063W 08/26/93	K40432W 08/26/93	K40433W 08/26/93	K40434W 08/26/93	K40435W 08/26/93
PCB											
Aroclor 1016	ND(0.10U)	ND(0.099UJ)	ND(0.050U)	ND(0.10UJ)	ND(0.10U)	ND(0.049U)	ND(0.050U)	ND(0.050U)	ND(0.099U)	ND(0.049UJ)	ND(0.10UJ)
Aroclor 1242	ND(0.10U)	ND(0.099UJ)	ND(0.050U)	ND(0.10UJ)	ND(0.10U)	ND(0.049U)	ND(0.050U)	ND(0.050U)	ND(0.099U)	ND(0.049UJ)	ND(0.10UJ)
Aroclor 1248	ND(0.10U)	ND(0.099UJ)	ND(0.050U)	ND(0.10UJ)	ND(0.10U)	ND(0.049U)	ND(0.050U)	ND(0.050U)	ND(0.099U)	ND(0.049UJ)	ND(0.10UJ)
Aroclor 1254	0.83	0.74 J	0.45	0.73 J	0.84	0.64	0.69	0.74	0.92	0.58 J	0.93 J
Aroclor 1260	0.083 J	0.082 J	0.039 J	0.074 J	0.10	0.065	0.070	0.063	0.076 J	0.042 J	0.076 J
Total PCB	0.91J	0.82J	0.49J	0.80J	0.94	0.71	0.76	0.80	1.0J	0.62J	1.0J
Pesticide											
3-bromobiphenyl	0.010 J	ND(0.010UJ)	ND(0.010U)	0.019 J	0.013 J	ND(0.010UJ)	0.013 J	0.010 J	0.011 J	ND(0.010UJ)	0.011 J
gamma-BHC	ND(0.0050UJ)	ND(0.0050UJ)	0.0061	0.0081 J	ND(0.0050UJ)	ND(0.0050UJ)	ND(0.0050UJ)	0.0054	ND(0.0050UJ)	ND(0.0050UJ)	ND(0.0050UJ)
Heptachlor Epoxide	ND(0.0050UJ)	ND(0.0050UJ)	ND(0.0050U)	ND(0.0050UJ)	0.0054 JN	ND(0.0050UJ)	ND(0.0050UJ)	ND(0.0050U)	ND(0.0050UJ)	ND(0.0050UJ)	R
gamma-Chlordane	0.0089 J	0.0083 J	0.0058	0.0072 J	0.0097 J	0.0065 J	0.0066 J	0.0083	0.0082 J	0.0060 J	0.010 J
4,4'-DDE	0.042 J	0.038 J	0.026 J	0.041 J	0.047 J	0.0029 JN	0.0030 JN	0.040 J	0.039 J	0.026 J	0.049 J
4,4'-DDD	0.012 J	0.012 J	ND(0.010U)	R	0.014 J	ND(0.010UJ)	0.011 JN	0.011 JN	0.013 JN	0.013 J	0.015 J
TAL											
Total Mercury	0.01 BJN	0.02 BJN	0.01 BJN	0.01 BJN	0.01 BJN	0.01 BJN	0.01 BJN	0.010 BJN	0.01 BJN	0.01 BJN	0.01 BJN

Notes:

¹ Showing only the results for compounds/analytes detected above the quantitation limit.

² Skin-on, scale-on fillets.

³ Skin-off fillets.

D - Concentration is based on a diluted sample.

J - The compound/analyte was positively identified; however, the associated numerical value is an estimated concentration only.

R - The sample results were rejected.

U - The compound was analyzed for but not detected. The associated value is the compound quantitation limit.

UJ - The compound was not detected above the sample quantitation limit. However, the reported limit is approximate and may or may not represent the actual limit of quantitation.

B - The reported value was obtained from a reading less than the contract required detection limit (CRDL) but greater than or equal to the instrument detection limit (IDL).

N - For PCB and Pesticides, the analysis indicates the presence of a compound for which there is presumptive evidence to make a tentative identification. For Total Mercury - spiked sample recovery not within control limits.

NA - Sample not analyzed.

D - Concentration is based on a diluted sample.

ND - Not detected.

TABLE 3-28

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
ABSA 3 - FISH

Smallmouth Bass Samples ¹											
Sample Number:	K40045	K40046	K40047	K40048	K40049	K40050	K40051	K40052	K40053	K40054	K40055
Sample Date:	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93
Field Data											
Gender	Male	Female	Male	Female	Female	Female	Female	Male	Male	Female	Male
Length (cm)	40	37	34	37	34	33	30	31	29	31	31
Whole Body Weight (g)	730	640	500	580	450	450	320	330	320	320	310
Laboratory Data											
Fillet % Lipids	2.62	1.36	1.49	2.68	0.90	0.97	0.67	0.52	1.04	1.13	0.56
Rem. Carc. % Lipids	14.0	3.40	3.50	3.50	5.30	3.60	3.50	2.80	3.90	4.10	3.00
Fillet Weight (g)	289	286	218	255	184	187	140	141	144	152	133
Total PCB (mg/kg)											
Fillet	3.2	0.99	1.4	1.7	0.75	0.61	0.82	0.38	0.42	0.89	0.75
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calculated Whole Body	12	1.8	2.4	2.0	3.0	1.6	2.8	1.3	1.1	2.2	2.6
Lipid-adjusted PCB (mg/kg-lipid)											
Fillet	120	71	93	63	83	63	120	73	42	81	130
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

See notes on page 3.

TABLE 3-28

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
ABSA 3 - FISH

Carp Samples ²											
Sample Number:	K40034	K40035	K40036	K40037	K40038	K40039	K40040	K40041	K40042	K40043	K40044
Sample Date:	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93
Field Data											
Gender	Male	Female	Female	Female	Female	Female	Male	Female	Female	Male	Male
Length (cm)	59	63	65	55	59	59	51	51	48	54	53
Whole Body Weight (g)	2900	3100	4000	2000	2100	2700	1600	1800	1500	1800	1800
Laboratory Data											
Fillet % Lipids	3.31	0.89	3.26	3.49	1.89	4.75	1.73	6.82	7.40	1.85	3.60
Rem. Carc. % Lipids	5.20	1.90	6.00	7.80	1.40	6.90	4.30	13.6	8.70	6.66	10.55
Fillet Weight (g)	681	737	1240	573	743	884	469	668	543	470	567
Total PCB (mg/kg)											
Fillet	7.5	1.4	8.2	3.0	4.1	7.3	4.3	3.4	3.3	2.7	3.5
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calculated Whole Body	11	2.6	13	5.6	3.4	9.5	8.9	5.7	3.7	7.7	8.4
Lipid-adjusted PCB (mg/kg-lipid)											
Fillet	230	160	250	86	220	150	250	50	45	140	97
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

See notes on page 3.

TABLE 3-28

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
ABSA 3 - FISH

Northern Hog Sucker Whole Body Samples											
Sample Number:	K40057W	K40058W	K40059W	K40060W	K40061W	K40062W	K40063W	K40432W	K40433W	K40434W	K40435W
Sample Date:	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93	08/26/93
Field Data											
Gender	Female	Male	Male	Male	Male	Female	Male	Male	Male	Male	Male
Length (cm)	20	21	19	18	19	18	17	17	20	15	22
Whole Body Weight (g)	89	75	79	61	76	62	60	60	91	39	130
Laboratory Data (mg/kg)											
% Lipids	6.31	6.38	4.28	5.63	6.05	4.26	5.36	5.71	5.71	5.00	7.21
Total PCB (mg/kg)											
	0.91J	0.82J	0.49J	0.80J	0.94	0.71	0.76	0.80	1.0J	0.62J	1.0J
Lipid-adjusted PCB (mg/kg-lipid)											
	14	13	11	14	15	17	14	14	18	12	14

Notes:¹ Skin-on, scale-on fillets.² Skin-off fillets.

J - The compound/analyte was positively identified; however, the associated numerical value is an estimated concentration only.

NA - Not analyzed.

TABLE 3-29

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 4 - FISH

Smallmouth Bass Fillet Samples ²											
Sample Number:	K40103	K40104	K40105	K40106	K40107	K40108	K40109	K40110	K40111	K40112	K40113
Sample Date:	09/01/93	09/01/93	09/01/93	09/01/93	09/01/93	09/01/93	09/01/93	09/01/93	09/01/93	09/01/93	09/01/93
PCB											
Aroclor 1016	0.12	0.15	0.13	0.049 J	0.098	0.038 J	ND(0.050UJ)	ND(0.050U)	ND(0.050U)	0.096	0.16
Aroclor 1242	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050UJ)	ND(0.050U)	0.34	ND(0.050U)	ND(0.050U)
Aroclor 1248	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050UJ)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)
Aroclor 1254	0.38	0.41	0.36	0.21	0.25	0.085	0.42 J	0.31	0.23	0.14	0.37
Aroclor 1260	0.074	0.065	0.070	0.059	0.090	0.040 J	0.13 J	0.13	0.053	0.047 J	0.19
Total PCB	0.57	0.63	0.56	0.32J	0.44	0.16J	0.55J	0.44	0.62	0.28J	0.72
Pesticide											
Heptachlor Epoxide	0.0067	0.0082	0.0075	ND(0.0050UJ)	ND(0.0050U)	ND(0.0050U)	ND(0.0050UJ)	ND(0.0050U)	0.0093	ND(0.0050U)	0.0080
4,4'-DDE	0.013 JN	0.015 JN	0.015 JN	ND(0.010UJ)	0.010 JN	ND(0.010U)	0.015 J	ND(0.010U)	0.011 JN	ND(0.010U)	0.015 JN
TAL											
Total Mercury	0.14	0.12	0.16	0.14	0.14	0.32	0.18	0.27	0.11	0.11	0.12
Carp Fillet Samples ³											
Sample Number:	K40092	K40093	K40094	K40095	K40096	K40097	K40099	K40100	K40101	K40102	K40391
Sample Date:	09/01/93	09/01/93	09/01/93	09/01/93	09/01/93	09/01/93	09/01/93	09/01/93	09/01/93	09/01/93	10/15/93
PCB											
Aroclor 1016	ND(1.0U)	1.2	ND(0.75U)	3.0	ND(0.75U)	2.3	0.90	3.2	ND(0.10U)	1.9	0.51
Aroclor 1242	ND(1.0U)	ND(0.50U)	ND(0.75U)	ND(1.0U)	2.6	ND(0.75U)	ND(0.50U)	ND(1.0U)	ND(0.10U)	ND(0.75U)	ND(0.25U)
Aroclor 1248	ND(1.0U)	ND(0.50U)	ND(0.75U)	ND(1.0U)	ND(0.75U)	ND(0.75U)	ND(0.50U)	ND(1.0U)	ND(0.10U)	ND(0.75U)	ND(0.25U)
Aroclor 1254	7.5	3.3	4.6	9.6	4.7	4.9	2.8	7.3	0.83	4.8	1.9
Aroclor 1260	0.85	0.48 J	0.61 J	ND(1.0U)	ND(0.75U)	ND(0.75U)	0.39 J	0.86 J	0.34	0.53 J	0.18 J
Total PCB	8.4	5.0J	5.2J	13	7.3	7.2	4.1J	11J	1.2	7.2J	2.6J
Pesticide											
3-bromobiphenyl	ND(0.040U)	ND(0.010U)	ND(0.020U)	ND(0.040U)	ND(0.020U)	ND(0.020U)	ND(0.010U)	ND(0.020U)	ND(0.010U)	ND(0.020U)	0.040
Aldrin	0.17 J	0.069 J	0.099 J	0.22 J	0.11	0.13	0.065 J	0.16	0.012 JN	0.11 J	0.037 J
Heptachlor Epoxide	0.065	0.019 J	0.031	0.12	0.060	0.041	0.019 J	0.057	ND(0.0050U)	0.050	0.020 JN
gamma-Chlordane	0.10 JN	0.031 JN	0.046 JN	0.11 JN	0.049 JN	0.046 JN	0.032 J	0.066 JN	0.0060 JN	0.048 JN	0.017
alpha-Chlordane	0.13	0.028	0.038	0.11	0.047	0.028 J	0.033	0.054	ND(0.0050U)	0.032 J	0.015
cis-Nonachlor	0.10	0.029 J	0.055 J	0.10 J	0.049 J	0.048 J	0.025 J	0.082 J	0.012	0.051 J	0.013 JN
4,4'-DDE	0.37 J	0.12 J	0.16 J	0.39 J	0.19 J	0.14 J	0.094 J	0.26 J	0.035 J	0.17 J	0.076 J
4,4'-DDD	0.24	0.051	0.079	0.19	0.077	0.069	0.037	0.11	ND(0.010U)	0.074	0.025
TAL											
Total Mercury	0.090	0.11	0.11	0.15	0.10	0.090	0.12	0.11	0.16	0.10	0.060 JN

See notes on page 2.

TABLE 3-29

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 4 - FISH

Golden Redhorse Whole Body Samples											
Sample Number:	K40114W	K40115W	K40116W	K40117W	K40392W	K40393W	K40394W	K40395W	K40396W	K40397W	K40398W
Sample Date:	09/01/93	09/01/93	09/01/93	09/01/93	10/15/93	10/15/93	10/15/93	10/15/93	10/15/93	10/15/93	10/15/93
PCB											
Aroclor 1016	ND(0.25U)	0.64	0.17 J	ND(0.25U)	ND(0.25U)	ND(0.25U)	ND(0.25U)	ND(0.25U)	ND(0.25U)	0.38	ND(0.10U)
Aroclor 1242	1.1	ND(0.25U)	ND(0.25U)	0.74	0.75	0.71	0.48	0.65	0.71	ND(0.10U)	ND(0.10U)
Aroclor 1248	ND(0.25U)	ND(0.25U)	0.80	ND(0.25U)	ND(0.25U)	ND(0.25U)	ND(0.25U)	ND(0.25U)	ND(0.25U)	ND(0.10U)	1.2
Aroclor 1254	1.7	2.0	0.86	1.3	1.4	1.5	1.0	1.5	1.5	0.97	1.3
Aroclor 1260	ND(0.25U)	0.24 J	0.16 J	0.16 J	0.18 J	0.18 J	0.11 J	0.21 J	0.15 J	0.11	0.21
Total PCB	2.8	2.9J	2.0J	2.2J	2.3J	2.4J	1.6J	2.4J	2.4J	1.5	2.7
Pesticide											
Aldrin	0.050 J	0.037 JN	0.050 J	0.041 JN	0.037 J	0.042 J	0.028 J	0.037 J	0.050 J	0.025 J	0.040 J
Heptachlor Epoxide	R	0.045 JN	0.048 JN	R	R	R	R	R	R	0.016	0.025
alpha-Chlordane	0.021 J	0.019	0.016	0.010 JN	0.011	0.0075 JN	0.0079	0.010	0.014	0.0087	0.013
cis-Nonachlor	0.021 J	0.028 J	0.022	0.021	0.019 J	0.021	0.014 J	0.021	0.026	0.012	0.017 J
4,4'-DDE	0.087 J	0.11	0.082 J	0.077	0.070 J	0.074 J	0.054 J	0.075 J	0.088 J	0.043 J	0.059 J
4,4'-DDD	0.039	0.035	0.027	0.020	0.024	0.022	0.015	0.021	0.038	0.014	0.021
TAL											
Total Mercury	0.020	0.020 B	0.010 B	0.020	0.020 B	0.020 B	0.020	0.020	0.020	0.020 B	0.020

Notes:

¹ Showing only the results for compounds detected above the quantification limit.

² Skin-on, scale-on fillets.

³ Skin-off fillets.

J - The compound/analyte was positively identified; however, the associated numerical value is an estimated concentration only.

N - For PCB and Pesticides, the analysis indicates the presence of a compound for which there is presumptive evidence to make a tentative identification. For Total Mercury, spiked sample recovery not within control limits.

R - The sample results were rejected.

U - The compound was analyzed for but not detected. The associated value is the compound quantitation limit.

UJ - The compound was not detected above the sample quantitation limit. However, the reported limit is approximate and may or may not represent the actual limit of quantitation.

B - The reported value was obtained from a reading less than the contract required detection limit (CRDL) but greater than or equal to the instrument detection limit (IDL).

ND - Not Detected.

TABLE 3-30

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
ABSA 4 - FISH

Smallmouth Bass Samples ¹											
Sample Number:	K40103	K40104	K40105	K40106	K40107	K40108	K40109	K40110	K40111	K40112	K40113
Sample Date:	09/01/93	09/01/93	09/01/93	09/01/93	09/01/93	09/01/93	09/01/93	09/01/93	09/01/93	09/01/93	09/01/93
Field Data											
Gender	Female	Female	Female	Male	Female	Male	Male	Male	Female	Female	Male
Length (cm)	34	32	31	31	31	43	33	37	33	31	31
Whole Body Weight (g)	460	390	380	360	340	830	430	530	430	300	340
Laboratory Data											
Fillet % Lipids	0.78	1.34	1.49	0.66	0.62	0.44	0.66	0.32	0.91	0.43	1.14
Rem. Carc. % Lipids	3.80	4.12	3.40	1.70	2.10	7.10	1.30	0.72	2.60	2.50	3.90
Fillet Weight (g)	182	154	147	144	147	304	181	184	180	117	144
Total PCB (mg/kg)											
Fillet	0.57	0.63	0.56	0.32J	0.44	0.16J	0.55J	0.44	0.62	0.28J	0.72
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calculated Whole Body	1.9	1.5	0.99	0.63	1.0	1.7	0.86	0.80	1.3	1.1	1.8
Lipid-adjusted PCB (mg/kg-lipid)											
Fillet	73	48	37	48	71	36	83	140	68	65	65
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

See notes on page 3.

TABLE 3-30

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
ABSA 4 - FISH

Carp Samples²											
Sample Number:	K40092	K40093	K40094	K40095	K40096	K40097	K40099	K40100	K40101	K40102	K40391
Sample Date:	09/01/93	09/01/93	09/01/93	09/01/93	09/01/93	09/01/93	09/01/93	09/01/93	09/01/93	09/01/93	10/15/93
Field Data											
Gender	Female	Female	Male	Female	Female	Female	Female	Female	Female	Male	Male
Length (cm)	56	65	65	60	64	58	56	61	56	55	51
Whole Body Weight (g)	2800	4100	3700	3200	3700	2800	2800	3100	2700	2200	1300
Laboratory Data											
Fillet % Lipids	8.88	3.76	2.84	13.83	8.56	5.07	2.22	9.10	0.74	7.73	4.32
Rem. Carc. % Lipids	11.40	10.00	5.90	23.10	20.10	12.40	6.70	14.10	1.70	16.10	7.3
Fillet Weight (g)	689	989	784	951	929	866	708	843	583	545	475
Total PCB (mg/kg)											
Fillet	8.4	5.0J	5.2J	13	7.3	7.2	4.1J	11J	1.2	7.2J	2.6J
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calculated Whole Body	9.9	11	9.7	19	15	14	10	15	2.4	13	3.7
Lipid-adjusted PCB (mg/kg-lipid)											
Fillet	94	130	190	93	85	140	190	120	160	94	60
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

See notes on page 3.

TABLE 3-30

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
ABSA 4 - FISH

Golden Redhorse Whole Body Samples											
Sample Number:	K40114W	K40115W	K40116W	K40117W	K40392W	K40393W	K40394W	K40395W	K40396W	K40397W	K40398W
Sample Date:	09/01/93	09/01/93	09/01/93	09/01/93	10/15/93	10/15/93	10/15/93	10/15/93	10/15/93	10/15/93	10/15/93
Field Data											
Gender	Male	Male	Male	Male	Male	Female	Male	Female	Male	Male	Male
Length (cm)	26	26	17	16	21	18	17	17	17	16	16
Whole Body Weight (g)	220	230	63	54	110	60	50	50	50	40	40
Laboratory Data											
% Lipids	5.22	5.94	3.65	2.20	4.89	4.44	2.50	3.57	4.08	2.46	3.42
Total PCB (mg/kg)											
	2.8	2.9J	2.0J	2.2J	2.3J	2.4J	1.6J	2.4J	2.4J	1.5	2.7
Lipid-adjusted PCB (mg/kg-lipid)											
	54	49	54	100	47	55	64	67	59	60	79

Notes:¹ Skin-on, scale-on fillets.² Skin-off fillets.

NA - Not analyzed.

J - The compound was positively identified; however, the associated numerical value is an estimated concentration only.

TABLE 3-31

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 5 - FISH

Smallmouth Bass Fillet Samples ²											
Sample Number:	K40351	K40352	K40353	K40354	K40369	K40370	K40371	K40372	K40373	K40374	K40375
Sample Date:	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93
PCB											
Aroclor 1016	ND(0.10UJ)	0.29	1.0	0.46	0.71	0.71	0.48	ND(0.25U)	ND(0.25U)	ND(0.25U)	ND(0.050U)
Aroclor 1242	0.36 J	ND(0.10U)	ND(0.25U)	ND(0.10U)	ND(0.10U)	ND(0.050U)	ND(0.10U)	ND(0.25U)	ND(0.25U)	ND(0.25U)	ND(0.050U)
Aroclor 1248	ND(0.10UJ)	ND(0.10U)	ND(0.25U)	ND(0.10U)	ND(0.10U)	ND(0.050U)	ND(0.10U)	1.2	1.6	ND(0.25U)	0.40
Aroclor 1254	0.90 J	0.89	2.6	1.1	1.4	0.77	1.1	0.41	0.60	1.3	0.22
Aroclor 1260	0.092 J	0.14	0.29	0.10	0.15	ND(0.050U)	ND(0.10U)	0.13 J	ND(0.25U)	0.14 J	0.058
Total PCB	1.4J	1.3	3.9	1.7	2.3	1.5	1.6	1.7J	2.2	1.4J	0.68
Pesticide											
Aldrin	R	0.021 JN	0.042 JN	0.023 JN	0.032 JN	ND(0.0050U)	R	0.029 JN	0.032 JN	0.016 JN	0.012
Heptachlor Epoxide	0.022	ND(0.0050U)	0.047	0.024	ND(0.0050U)	0.018	0.023	0.035	0.039	0.013	0.010
gamma-Chlordane	ND(0.0050U)	ND(0.0050U)	R	R	R	0.0066	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)
alpha-Chlordane	ND(0.0050U)	ND(0.0050U)	0.0085	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)
4,4'-DDE	ND(0.010U)	0.029 J	0.055 J	0.029 J	ND(0.010U)	ND(0.010U)	0.028 JN	0.029 JN	0.031 JN	0.045 J	0.013
TAL											
Total Mercury	0.36	0.12	0.13	0.070	0.28	0.33	0.16 JN*	0.070 JN*	0.15 JN*	0.20 JN*	0.15 JN*
Smallmouth Bass Remaining Carcass Samples											
Sample Number:	K40351	K40352	K40353	K40354	K40369	K40370	K40371	K40372	K40373	K40374	K40375
Sample Date:	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93
PCB											
Aroclor 1016	ND(0.50UJ)	1.3	1.7	1.2	0.87	ND(0.25U)	NA	NA	NA	NA	NA
Aroclor 1242	1.3 J	ND(0.50U)	ND(0.50U)	ND(0.25U)	ND(0.25U)	2.0	NA	NA	NA	NA	NA
Aroclor 1248	ND(0.50UJ)	ND(0.50U)	ND(0.50U)	ND(0.25U)	ND(0.25U)	ND(0.25U)	NA	NA	NA	NA	NA
Aroclor 1254	3.4 J	4.2	5.0	3.1	1.7	2.3	NA	NA	NA	NA	NA
Aroclor 1260	0.86 J	0.58	0.53	0.36	0.25 J	ND(0.25U)	NA	NA	NA	NA	NA
Total PCB	5.6J	6.1	7.2	4.7	2.8J	4.3	NA	NA	NA	NA	NA
Pesticide											
2-bromobiphenyl	0.049	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	NA	NA	NA	NA	NA
Aldrin	R	0.072 JN	0.074 JN	0.059 J	ND(0.0050U)	R	NA	NA	NA	NA	NA
Heptachlor Epoxide	0.11 DJ	0.070	0.097 DJ	ND(0.0050U)	0.032 J	0.050	NA	NA	NA	NA	NA
alpha-Chlordane	ND(0.0050U)	ND(0.0050U)	0.015	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	NA	NA	NA	NA	NA
4,4'-DDE	0.087 J	0.14	0.11 J	0.097	ND(0.010U)	0.054 J	NA	NA	NA	NA	NA
4,4'-DDD	0.011	0.025	0.019 J	0.015 J	ND(0.010U)	0.11	NA	NA	NA	NA	NA
TAL											
Total Mercury	0.28	0.080	0.10	0.050	0.19	0.16	NA	NA	NA	NA	NA

See notes on page 3.

TABLE 3-31

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 5 - FISH

Carp Fillet Samples ³											
Sample Number:	K40350	K40359	K40360	K40361	K40362	K40363	K40364	K40365	K40366	K40367	K40368
Sample Date:	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93
PCB											
Aroclor 1016	ND(0.10U)	ND(0.50U)	ND(0.50U)	ND(1.0U)	ND(0.50U)	ND(0.10U)	ND(0.25U)	ND(0.25U)	ND(0.50U)	ND(0.10U)	ND(0.50U)
Aroclor 1242	ND(0.10U)	ND(0.50U)	ND(0.50U)	11	ND(0.50U)	ND(0.10U)	ND(0.25U)	ND(0.25U)	ND(0.50U)	ND(0.10U)	ND(0.50U)
Aroclor 1248	0.93	4.5	3.6	ND(1.0U)	5.1	1.3	1.8	2.8	1.5	1.2	4.2
Aroclor 1254	0.51	1.2	3.1	6.2	2.8	0.84	1.2	2.1	2.8	0.91	2.5
Aroclor 1260	ND(0.10U)	0.30 J	ND(0.50U)	ND(1.0U)	ND(0.50U)	ND(0.10U)	ND(0.25U)	ND(0.25U)	1.4	0.15	ND(0.50U)
Total PCB	1.4	6.0J	6.7	17	7.9	2.1	3.0	4.9	5.7	2.3	6.7
Pesticide											
3-bromobiphenyl	ND(0.010U)	ND(0.010U)	ND(0.020U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	R	ND(0.010U)	0.0074 JN
Aldrin	0.031 J	0.13 DJ	0.16 EJ	0.42 DJ	0.14 DJ	0.049 J	0.062 J	0.10 DJ	0.077 J	0.040 J	0.14 DJ
Dieldrin	0.015	ND(0.010U)	ND(0.020U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)
Heptachlor Epoxide	0.019 J	0.051 J	0.11	0.22 DJ	0.061 J	ND(0.0050U)	0.034 J	0.043	0.047	0.023	0.055 J
gamma-Chlordane	0.010 JN	R	0.061 JN	0.066	0.039 JN	0.016	0.020 JN	0.031 JN	R	0.014 JN	R
alpha-Chlordane	ND(0.0050U)	ND(0.0050U)	0.049	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	0.022	0.013	ND(0.0050U)	0.015
cis-Nonachlor	ND(0.0050U)	ND(0.0050U)	0.037 J	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	0.018 J	ND(0.0050U)	0.013	0.025
4,4'-DDE	0.024 JN	ND(0.010U)	0.18 J	0.13 J	0.10 J	ND(0.010U)	0.045 J	0.087 J	0.13 J	0.043 J	0.068 JN
4,4'-DDD	0.010	0.022	0.072	0.049	0.035	0.012 J	0.018	0.035	0.025	0.013	0.026
TAL											
Total Mercury	0.070	0.030	0.10 JN	0.10	0.080	0.030	0.050	0.13 JN	0.12 JN	0.090 JN	0.060 JN
Carp Remaining/Carcass Samples											
Sample Number:	K40350	K40359	K40360	K40361	K40362	K40363	K40364	K40365	K40366	K40367	K40368
Sample Date:	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93
PCB											
Aroclor 1016	ND(0.50UJ)	ND(1.0U)	NA	ND(1.0U)	ND(0.50U)	ND(0.50U)	ND(0.50U)	NA	NA	NA	NA
Aroclor 1242	ND(0.50UJ)	ND(1.0U)	NA	8.6	ND(0.50U)	ND(0.50U)	ND(0.50U)	NA	NA	NA	NA
Aroclor 1248	4.6 J	9.6	NA	ND(1.0U)	5.2	4.3	3.0	NA	NA	NA	NA
Aroclor 1254	2.6 J	2.5	NA	5.1	2.8	2.0	2.0	NA	NA	NA	NA
Aroclor 1260	ND(0.50UJ)	0.64 J	NA	ND(1.0U)	ND(0.50U)	0.42 J	ND(0.50U)	NA	NA	NA	NA
Total PCB	7.2J	13J	NA	14	8.0	6.7J	5.0	NA	NA	NA	NA
Pesticide											
2-bromobiphenyl	ND(0.010U)	0.065	NA	ND(0.010U)	0.10 J	0.13 JN	ND(0.010U)	NA	NA	NA	NA
Aldrin	0.16 DJ	0.26 DJ	NA	0.29 DJ	0.14 DJ	0.12 DJ	0.12 DJ	NA	NA	NA	NA
Heptachlor Epoxide	0.056 J	0.12 DJ	NA	0.16 DJ	ND(0.0050U)	0.044 J	0.052 J	NA	NA	NA	NA
gamma-Chlordane	0.045 JN	R	NA	R	0.055 J	0.030 JN	0.032 JN	NA	NA	NA	NA
4,4'-DDE	0.12 J	0.092 J	NA	0.12 J	0.14	0.070 J	0.076 J	NA	NA	NA	NA
4,4'-DDD	0.053	0.045	NA	0.046	0.035 DJ	0.030	0.032	NA	NA	NA	NA
TAL											
Total Mercury	0.070	0.010 B	NA	0.060	0.060	0.010 B	0.040	NA	NA	NA	NA

See notes on page 3.

TABLE 3-31

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 5 - FISH

Golden Redhorse Whole Body Samples											
Sample Number:	K40376W	K40377W	K40378W	K40379W	K40380W	K40381W	K40382W	K40383W	K40384W	K40385W	K40386W
Sample Date:	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93
PCB											
Aroclor 1016	ND(0.10U)	ND(0.10U)	ND(0.25U)	ND(0.25U)	ND(0.10U)	0.62	ND(0.050U)	ND(0.25U)	ND(0.10U)	ND(0.10U)	ND(0.25U)
Aroclor 1242	0.71	ND(0.10U)	ND(0.25U)	ND(0.25U)	ND(0.10U)	ND(0.25U)	ND(0.050U)	ND(0.25U)	ND(0.10U)	ND(0.10U)	ND(0.25U)
Aroclor 1248	ND(0.10U)	0.99	1.4	2.2	0.80	ND(0.25U)	0.50	1.4	1.3	0.94	1.2
Aroclor 1254	1.3	0.95	1.0	0.90	1.1	1.5	0.46	1.2	0.87	0.94	0.77
Aroclor 1260	ND(0.10U)	0.18	0.23 J	ND(0.25U)	ND(0.10U)	0.11 J	0.085	0.21 J	0.18	0.15	0.15 J
Total PCB	2.0	2.1	2.6J	3.1	1.9	2.2J	1.0	2.8J	2.4	2.0	2.1J
Pesticide											
Aldrin	0.040 J	0.044 J	0.052 J	0.060 J	0.035 J	0.051 J	0.028 J	0.052 J	0.043 J	0.052 J	0.042 J
Heptachlor Epoxide	0.034	0.038	0.043	0.047	0.029	R	R	R	R	R	R
alpha-Chlordane	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	0.0057	0.010 J	0.0077	0.011	0.0075
cis-Nonachlor	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	0.017	0.010	0.017 J	0.014 J	0.020	0.012
4,4'-DDE	0.043 J	0.045 JN	0.047 JN	0.045 J	0.038 J	0.043 JN	0.033 J	0.052 J	0.037 JN	0.057 J	0.034 JN
4,4'-DDD	0.016	0.016	0.018	0.019	0.014	0.015	0.010	0.019	0.014	0.021	0.013
TAL											
Total Mercury	0.020	0.030 B	0.020	0.020	0.020	0.030 B	0.030	0.020	0.020	0.030	0.020

Notes:¹ Showing only the results for compounds/analytes detected above the quantitation limit.² Skin-on, scale-on fillets.³ Skin-off fillets.

E - The compound was quantified above the calibration range.

D - Concentration is based on a diluted sample analysis.

J - The compound/analyte was positively identified; however, the associated numerical value is an estimated concentration only.

N - For PCB and Pesticides, the analysis indicates the presence of a compound for which there is presumptive evidence to make a tentative identification.

For Total Mercury, spiked sample recovery not within control limits.

R - The sample results were rejected.

U - The compound was analyzed for but not detected. The associated value is the compound quantitation limit.

UJ - The compound was not detected above the sample quantitation limit. However, the reported limit is approximate and may or may not represent the actual limit of quantitation.

B - The reported value was obtained from a reading less than the contract required detection limit (CRDL) but greater than or equal to the instrument detection limit (IDL).

* - Duplicate analysis not within control limit.

NA - Sample not analyzed.

ND - Not Detected.

TABLE 3-32

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
ABSA 5 - FISH

Smallmouth Bass Samples ¹											
Sample Number:	K40351	K40352	K40353	K40354	K40369	K40370	K40371	K40372	K40373	K40374	K40375
Sample Date:	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93
Field Data											
Gender	Male	Male	Female	Female	Male	Female	Female	Female	Female	Male	Female
Length (cm)	39	30	29	29	38	36	36	34	39	36	34
Whole Body Weight (g)	810	290	290	310	790	640	620	540	810	610	510
Laboratory Data											
Fillet % Lipids	1.0	0.61	1.6	2.4	1.0	0.80	1.0	1.4	1.4	0.85	0.81
Rem. Carc. % Lipids	4.7	3.0	2.8	3.5	1.3	2.6	3.5	7.4	2.9	3.2	3.7
Fillet Weight (g)	100	100.0	100	100	100	100	220	190	270	230	170
Total PCB (mg/kg)											
Fillet	1.4J	1.3	3.9	1.7	2.3	1.5	1.6	1.7J	2.2	1.4J	0.68
Remaining Carcass	5.6J	6.1	7.2	4.7	2.8J	4.3	NA	NA	NA	NA	NA
Calculated Whole Body	5.1	4.4	6.1	3.7	2.7	3.9	4.2	6.4	3.8	3.8	2.3
Lipid-adjusted PCB (mg/kg-lipid)											
Fillet	140	210	240	71	230	190	160	120	160	160	84
Remaining Carcass	120	200	260	130	220	170	NA	NA	NA	NA	NA
Carp Samples ²											
Sample Number:	K40350	K40359	K40360	K40361	K40362	K40363	K40364	K40365	K40366	K40367	K40368
Sample Date:	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93
Field Data											
Gender	Male	Female	Female	Female	Female	Male	Male	Female	Male	Female	Male
Length (cm)	52	60	63	61	62	55	55	58	54	50	52
Whole Body Weight (g)	2100	3200	3800	3100	3100	2200	2100	2600	2200	1500	2100
Laboratory Data											
Fillet % Lipids	1.4	2.9	12	12	7.0	2.6	4.0	4.1	5.9	2.2	3.8
Rem. Carc. % Lipids	8.7	5.9	18	9.5	8.5	5.6	6.0	7.1	5.3	7.7	7.7
Fillet Weight (g)	200	100	750	100	100	100	100	510	520	410	500
Total PCB (mg/kg)											
Fillet	1.4	6.0J	6.7	17	7.9	2.1	3.0	4.9	5.7	2.3	6.7
Remaining Carcass	7.2J	13J	NA	14	8.0	6.7J	5.0	NA	NA	NA	NA
Calculated Whole Body	6.6	13	9.4	14	8.0	6.5	4.9	7.8	5.3	6.5	12
Lipid-adjusted PCB (mg/kg-lipid)											
Fillet	100	210	56	140	110	81	75	120	97	100	180
Remaining Carcass	83	220	NA	150	94	120	83	NA	NA	NA	NA

See notes on page 2.

TABLE 3-32

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
ABSA 5 - FISH

Golden Redhorse Whole Body Samples											
Sample Number:	K40376W	K40377W	K40378W	K40379W	K40380W	K40381W	K40382W	K40383W	K40384W	K40385W	K40386W
Sample Date:	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93	10/14/93
Field Data											
Gender	Male	Male	Male	Female	Female	Female	Male	Male	Female	Male	Female
Length (cm)	21	17	18	18	17	16	17	17	16	16	15
Whole Body Weight (g)	98	58	61	57	50	49	46	44	44	47	37
Laboratory Data											
% Lipids	3.4	3.3	3.8	2.8	3.0	3.1	1.2	2.8	2.3	1.4	2.6
Total PCB (mg/kg)											
	2.0	2.1	2.6J	3.1	1.9	2.2J	1.0	2.8J	2.4	2.0	2.1J
Lipid-adjusted PCB (mg/kg-lipid)											
	59	64	67	110	63	71	83	100	100	140	81

Notes:¹ Skin-on, scale-on fillets.² Skin-off fillets.

J - The compound/analyte was positively identified; however, the associated numerical value is an estimated concentration only.

NA - Not analyzed.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 6 - FISH

Smallmouth Bass Fillet Samples ²											
Sample Number:	K40070	K40071	K40072	K40073	K40074	K40252	K40253	K40254	K40255	K40256	K40257
Sample Date:	08/30/93	08/30/93	08/30/93	08/30/93	08/30/93	10/11/93	10/11/93	10/11/93	10/11/93	10/11/93	10/11/93
PCB											
Aroclor 1016	0.20	ND(0.049U)	ND(0.10U)	ND(0.099U)	ND(0.050U)	ND(0.050U)	0.86	ND(0.050U)	ND(0.050U)	0.088	ND(0.050U)
Aroclor 1242	ND(0.050U)	ND(0.049U)	ND(0.10U)	ND(0.099U)	ND(0.050U)	ND(0.050U)	ND(0.25U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)
Aroclor 1248	ND(0.050U)	ND(0.049U)	ND(0.10U)	0.22	ND(0.050U)	ND(0.050U)	ND(0.25U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)
Aroclor 1254	0.72	0.52	1.1	0.54	0.19	0.26	2.4	0.57	0.48	0.21	0.71
Aroclor 1260	0.12	0.11	0.18	0.29	0.084	0.059	0.40	0.17	0.11	0.061	0.19
Total PCB	1.0	0.63	1.3	1.1	0.27	0.32	3.7	0.74	0.59	0.36	0.90
Pesticide											
2-bromobiphenyl	ND(0.010U)	ND(0.010UJ)	0.055 JN	ND(0.010UJ)	ND(0.010U)	ND(0.010U)	ND(0.040U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)
gamma-BHC	ND(0.0050U)	ND(0.0050UJ)	0.0053 J	ND(0.0050UJ)	0.0058 J	ND(0.0050U)	ND(0.020U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)
Aldrin	0.017 JN	R	0.022 JN	0.023 JN	ND(0.0050U)	ND(0.0050U)	0.066 J	0.0053 JN	ND(0.010 UD)	0.0071 J	0.010 JN
Dieldrin	ND(0.010U)	ND(0.010UJ)	ND(0.010UJ)	ND(0.010UJ)	0.053	0.041	ND(0.040U)	0.073	0.011	ND(0.010U)	ND(0.010U)
Heptachlor Epoxide	R	0.0072 J	0.020 J	0.021 J	ND(0.0050U)	ND(0.0050U)	0.056	ND(0.0050U)	ND(0.0050U)	R	0.0084
alpha-Chlordane	ND(0.0050U)	ND(0.0050UJ)	ND(0.0050UJ)	ND(0.0050UJ)	0.0051 J	0.0052	ND(0.020U)	0.0060	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)
trans-Nonachlor	ND(0.0050U)	ND(0.0050UJ)	R	R	0.011	0.011	ND(0.020U)	0.020	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)
4,4'-DDT	R	ND(0.010UJ)	R	R	0.074 JN	0.068	ND(0.040U)	0.11	0.042 J	0.020 J	R
4,4'-DDE	0.027 JN	0.020 J	0.042 J	0.061 J	0.16 EJ	0.30 DJ	0.14	0.17 DJ	0.18 DJ	0.076	0.042
4,4'-DDD	ND(0.010U)	ND(0.010UJ)	ND(0.010UJ)	0.011 J	0.070	0.081	ND(0.040U)	0.12	0.037	0.020	ND(0.010U)
TAL											
Total Mercury	0.14	0.31	0.18	0.15	0.09	0.11 JN	0.10 JN	0.13 JN	0.28 JN	0.16 JN	0.28 JN
Carp Fillet Samples ³											
Sample Number:	K40064	K40065	K40066	K40067	K40068	K40069	K40258	K40259	K40260	K40261	K40262
Sample Date:	08/30/93	08/30/93	08/30/93	08/30/93	08/30/93	08/30/93	10/11/93	10/11/93	10/11/93	10/11/93	10/11/93
PCB											
Aroclor 1016	0.25	1.1	0.34	ND(0.10U)	ND(0.50U)	ND(0.50U)	ND(0.50U)	ND(0.25U)	ND(0.10U)	ND(0.25U)	ND(0.50U)
Aroclor 1242	ND(0.050U)	ND(0.50U)	ND(0.10U)	ND(0.10U)	ND(0.50U)	ND(0.50U)	ND(0.50U)	ND(0.25U)	1.1	ND(0.25U)	ND(0.50U)
Aroclor 1248	ND(0.050U)	ND(0.50U)	ND(0.10U)	ND(0.10U)	ND(0.50U)	2.1	4.5	ND(0.25U)	ND(0.10U)	ND(0.25U)	ND(0.50U)
Aroclor 1254	0.56	3.5	0.93	0.96	3.5	1.4	2.7	1.1	0.34	2.7	5.9
Aroclor 1260	0.24	0.37 J	0.14	0.19	0.66	ND(0.50U)	0.83	0.79	ND(0.10U)	0.28	1.4
Total PCB	1.1	5.0J	1.4	1.2	4.2	3.5	8.0	1.9	1.4	3.0	7.3
Pesticide											
Aldrin	0.019 J	0.072 JN	0.027 J	0.017 JN	0.064 J	0.032 J	0.15 DJ	0.022 J	0.034 J	0.036 JN	0.057 J
Dieldrin	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	R	0.046 JN	0.015 JN	0.035	ND(0.010U)	ND(0.010U)
Heptachlor Epoxide	0.0071 JN	0.030 J	0.013	0.0065 J	0.028 J	0.012 J	0.076	R	R	R	0.045 J
gamma-Chlordane	0.0056 JN	R	R	0.0064 JN	R	0.014 JN	0.049 JN	0.012 DJN	ND(0.010 UDJ)	0.018 JN	R
alpha-Chlordane	ND(0.0050U)	0.013	ND(0.0050U)	ND(0.0050U)	0.013	ND(0.0050U)	0.038	0.011 J	0.013	ND(0.0050U)	0.015
trans-Nonachlor	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.010 UDJ)	ND(0.010 UDJ)	0.011 J	R	ND(0.0050U)
cis-Nonachlor	ND(0.0050U)	ND(0.0050U)	0.0071 JN	0.0067 JN	0.016	0.022 J	0.051	ND(0.0050U)	0.0065	0.024	ND(0.0050U)
4,4'-DDT	ND(0.010U)	R	ND(0.010U)	ND(0.010U)	R	R	R	R	0.024 JN	R	R
4,4'-DDE	0.033	0.097 J	0.025 J	0.053 J	0.079 J	0.10	0.32 DEJ	0.17 DJ	0.23 DJ	0.075 J	0.24 DJ
4,4'-DDD	ND(0.010U)	0.023 J	ND(0.010U)	0.0083 J	0.031	ND(0.010U)	0.15	0.069	0.092	0.014 J	0.049
TAL											
Total Mercury	0.17	0.18	0.15	0.20	0.18	0.14	0.17 JN	0.07 JN	0.05 JN	0.26 JN	0.11 JN

See notes on page 2.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 6 - FISH

Golden Redhorse Whole Body Samples											
Sample Number:	K40075W	K40076W	K40077W	K40078W	K40079W	K40080W	K40081W	K40264W	K40265W	K40266W	K40267W
Sample Date:	08/30/93	08/30/93	08/30/93	08/30/93	08/30/93	08/30/93	08/30/93	10/11/93	10/11/93	10/11/93	10/11/93
PCB											
Aroclor 1016	1.2	0.52	0.36 J	0.59 J	0.41 J	ND(0.098UJ)	0.39 J	ND(0.10U)	ND(0.10U)	ND(0.050U)	ND(0.10U)
Aroclor 1242	ND(0.25U)	ND(0.099U)	ND(0.10UJ)	ND(0.099UJ)	ND(0.10UJ)	ND(0.098UJ)	ND(0.099UJ)	0.82	ND(0.10U)	0.30	0.46
Aroclor 1248	1.5	0.87	0.69 J	0.70 J	0.78 J	1.2 J	0.85 J	ND(0.10U)	1.0	ND(0.050U)	ND(0.10U)
Aroclor 1254	1.9	0.95	1.1 J	1.2 J	0.98 J	1.1 J	1.1 J	0.92	0.81	0.39	0.64
Aroclor 1260	ND(0.25U)	ND(0.099U)	ND(0.10UJ)	0.12 J	0.089 J	0.14 J	0.12 J	ND(0.10U)	ND(0.10U)	ND(0.050U)	ND(0.10U)
Total PCB	4.6	2.3	2.2J	2.6J	2.3J	2.4J	2.5J	1.7	1.8	0.69	1.1
Pesticide											
2-bromobiphenyl	0.15 J	0.076 JN	ND(0.010UJ)	ND(0.010UJ)	0.12 J	0.088 JN	ND(0.010UJ)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)
Aldrin	0.068 J	0.040 J	0.030	0.045 J	0.049 J	0.045 J	0.044 J	0.038	0.034 J	0.015 J	0.023
Heptachlor Epoxide	0.056	0.033	ND(0.0050U)	R	R	0.038	0.037	0.032	0.026	0.012	0.019
gamma-Chlordane	R	R	R	R	R	R	R	R	R	0.0059 JN	R
alpha-Chlordane	ND(0.0050U)	ND(0.0050U)	0.0052 JN	0.0069	0.010 JN	ND(0.0050U)	0.0063 J	ND(0.0050U)	0.0058	ND(0.0050U)	ND(0.0050U)
4,4'-DDE	0.060	0.030 JN	0.032 J	0.039 JN	0.037 JN	0.039 JN	0.039 J	0.043 J	0.030 J	0.014 J	0.020 J
4,4'-DDD	0.026	0.015	0.014 JN	0.014	0.017	0.015	0.012	0.017	0.011 J	ND(0.010U)	ND(0.010U)
TAL											
Total Mercury	0.03 JN	0.03 JN	0.03 JN	0.03 JN	0.03 JN	0.03 JN	0.03 JN	0.03	0.02	0.02 B	0.02

Notes:

¹ Showing only the results for compounds/analytes detected above the quantification limit.

² Skin-on, scale-on fillets.

³ Skin-off fillets.

D - Concentration is based on a diluted sample analyses.

E - The compound was quantitated above the calibration range. The compound was positively identified; however the associated numerical value is an estimated concentration only.

J - The compound/analyte was positively identified; however, the associated numerical value is an estimated concentration only.

N - For PCB and Pesticides, the analysis indicates the presence of a compound for which there is presumptive evidence to make a tentative identification.

For Total Mercury, spiked sample recovery not within control limits.

R - The sample results were rejected.

U - The compound was analyzed for but not detected. The associated value is the compound quantitation limit.

UJ - The compound was not detected above the sample quantitation limit. However, the reported limit is approximate and may or may not represent the actual limit of quantitation.

B - The reported value was obtained from a reading less than the contract required detection limit (CRDL) but greater than or equal to the instrument detection limit (IDL).

NA - Sample not analyzed.

ND - Not detected.

TABLE 3-34

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE
BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
ABSA 6 - FISH

Smallmouth Bass Samples ¹											
Sample Number:	K40070	K40071	K40072	K40073	K40074	K40252	K40253	K40254	K40255	K40256	K40257
Sample Date:	08/30/93	08/30/93	08/30/93	08/30/93	08/30/93	10/11/93	10/11/93	10/11/93	10/11/93	10/11/93	10/11/93
Field Data											
Gender	Male	Male	Female	Female	Male	Male	Female	Male	Male	Male	Male
Length (cm)	37	36	32	31	28	32	34	36	39	42	34
Whole Body Weight (g)	620	610	420	360	300	550	630	800	860	950	530
Laboratory Data											
Fillet % Lipids	1.00	0.85	1.80	1.66	3.73	1.42	1.44	3.08	0.84	0.81	0.51
Rem. Carc. % Lipids	3.18	2.68	3.71	3.95	10.60	5.40	3.60	5.60	4.50	5.10	1.70
Fillet Weight (g)	278	245	186	155	141	227	247	286	331	322	161
Total PCB (mg/kg)											
Fillet	1.0	0.63	1.3	1.1	0.27	0.32	3.7	0.74	0.59	0.36	0.90
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calculated Whole Body	2.2	1.4	2.1	1.9	0.55	0.85	7.2	1.1	2.2	1.6	2.4
Lipid-adjusted PCB (mg/kg-lipid)											
Fillet	100	74	72	65	7.3	23	260	24	70	44	180
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

See notes on page 3.

TABLE 3-34

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
 SUPERFUND SITE
 BIOTA INVESTIGATION
 SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
 ABSA 6 - FISH

Carp Samples ²											
Sample Number:	K40064	K40065	K40066	K40067	K40068	K40069	K40258	K40259	K40260	K40261	K40262
Sample Date:	08/30/93	08/30/93	08/30/93	08/30/93	08/30/93	08/30/93	10/11/93	10/11/93	10/11/93	10/11/93	10/11/93
Field Data											
Gender	Female	Male	Male	Male	Male	Male	Male	Female	Male	Female	Male
Length (cm)	57	52	49	49	57	51	58	60	59	59	57
Whole Body Weight (g)	2700	2000	1500	1900	2600	1600	2700	3000	2900	2900	2400
Laboratory Data											
Fillet % Lipids	1.18	1.57	0.89	0.81	1.33	1.86	2.50	4.91	7.67	0.95	7.83
Rem. Carc. % Lipids	3.56	4.25	1.36	2.18	4.66	3.17	5.42	8.49	19.4	2.91	22.0
Fillet Weight (g)	741	517	407	457	701	464	751	782	833	891	682
Total PCB (mg/kg)											
Fillet	1.1	5.0J	1.4	1.2	4.2	3.5	8.0	1.9	1.4	3.0	7.3
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calculated Whole Body	2.7	11	2.0	2.8	12	5.2	15	2.9	2.9	7.3	17
Lipid-adjusted PCB (mg/kg-lipid)											
Fillet	92	310	160	150	320	180	320	39	18	320	94
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

See notes on page 3.

TABLE 3-34

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
 SUPERFUND SITE
 BIOTA INVESTIGATION
 SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
 ABSA 6 - FISH

Golden Redhorse Whole Body Samples											
Sample Number:	K40075W	K40076W	K40077W	K40078W	K40079W	K40080W	K40081W	K40264W	K40265W	K40266W	K40267W
Sample Date:	08/30/93	08/30/93	08/30/93	08/30/93	08/30/93	08/30/93	08/30/93	10/11/93	10/11/93	10/11/93	10/11/93
Field Data											
Gender	Male	Female	Male	Male	Male	Female	Male	Female	Female	Male	Male
Length (cm)	25	26	25	22	25	24	23	24	18	15	15
Whole Body Weight (g)	190	190	150	110	160	170	150	170	55	35	35
Laboratory Data											
% Lipids	4.94	5.64	3.31	2.05	4.02	4.28	3.11	2.52	2.36	1.01	1.96
Total PCB (mg/kg)											
	4.6	2.3	2.2J	2.6J	2.3J	2.4J	2.5J	1.7	1.8	0.69	1.1
Lipid-adjusted PCB (mg/kg-lipid)											
	94	41	67	120	58	56	81	68	75	69	55

Notes:¹ Skin-on, scale-on fillets.² Skin-off fillets.

J - The compound/analyte was positively identified; however, the associated numerical value is an estimated concentration only.

NA - Not analyzed.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 7 - FISH

Smallmouth Bass Fillet Samples ²											
Sample Number:	K40276	K40277	K40278	K40279	K40280	K40281	K40282	K40287	K40288	K40289	K40290
Sample Date:	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93
PCB											
Aroclor 1016	0.55	0.68	0.65	ND(0.050U)	ND(0.50U)	0.57	0.54	0.071	0.25	0.25	ND(0.050U)
Aroclor 1242	ND(0.10U)	ND(0.10U)	ND(0.10U)	ND(0.050U)	ND(0.50U)	ND(0.050U)	ND(0.10U)	ND(0.050U)	ND(0.10U)	ND(0.050U)	ND(0.050U)
Aroclor 1248	ND(0.10U)	ND(0.10U)	ND(0.10U)	0.31	ND(0.50U)	0.45	ND(0.10U)	ND(0.050U)	ND(0.10U)	ND(0.050U)	0.62
Aroclor 1254	0.98	1.0	1.2	0.17	3.4	0.40	1.3	0.26	0.86	0.41	0.34
Aroclor 1260	0.15	ND(0.10U)	ND(0.10U)	0.055	0.33 J	ND(0.050U)	0.14	0.059	0.093 J	0.061	0.11
Total PCB	1.7	1.7	1.9	0.54	3.7J	1.4	2.0	0.39	1.2J	0.72	1.1
Pesticide											
Aldrin	0.028 J	0.029 JN	0.026 J	0.011 JN	R	0.030 J	R	ND(0.0050U)	0.016 JN	0.014 JN	0.017 JN
Heptachlor Epoxide	0.024	0.025	0.026 J	0.0098 J	0.078	0.027	0.027	ND(0.0050U)	0.013	0.011	0.018
alpha-Chlordane	ND(0.0050U)	ND(0.0050U)	0.0058	ND(0.0050U)	0.015	ND(0.0050U)	ND(0.010U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)
cis-Nonachlor	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.015U)	ND(0.0050U)	0.017	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)
Dieldrin	ND (0.010U)	ND(0.010U)	0.011	ND(0.010U)	ND(0.030U)	ND(0.010U)	ND(0.020U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)
4,4'-DDE	0.051	0.043 J	0.093	0.018 J	0.16	0.039	0.095	0.012	0.050	0.022 J	0.027 J
4,4'-DDD	0.014	0.013	0.033	ND(0.010U)	0.036	0.023	0.025	ND(0.010U)	0.011	ND(0.010U)	ND(0.010U)
TAL											
Total Mercury	0.25 JN	0.10 JN	0.27 JN	0.19 JN	0.33 JN	0.31 JN	0.13 JN	0.33 JN	0.15 JN	0.10 JN	0.22 JN

See notes on page 3.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 7 - FISH

Carp Fillet Samples ³											
Sample Number:	K40268	K40269	K40270	K40271	K40272	K40273	K40274	K40275	K40284	K40285	K40286
Sample Date:	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93
PCB											
Aroclor 1016	ND(0.050U)	0.76	ND(0.050U)	ND(0.10U)	0.53	ND(0.25U)	ND(0.25U)	ND(0.25U)	ND(0.25UJ)	0.92	ND(0.25U)
Aroclor 1242	ND(0.050U)	ND(0.25U)	0.48	ND(0.10U)	ND(0.050U)	ND(0.25U)	2.2	1.2	ND(0.25UJ)	ND(0.25U)	3.0
Aroclor 1248	0.56	ND(0.25U)	ND(0.050U)	1.1	ND(0.050U)	ND(2.0U)	ND(0.25U)	ND(0.25U)	3.0 J	ND(0.25U)	ND(0.25U)
Aroclor 1254	0.30	1.8	0.23	0.83	0.62	0.37	1.7	1.4	2.4 J	2.0	3.4
Aroclor 1260	0.13	0.28	ND(0.050U)	ND(0.10U)	ND(0.050U)	0.19 J	ND(0.25U)	ND(0.25U)	ND(0.25UJ)	0.22 J	ND(0.25U)
Total PCB	0.99	2.8	0.71	1.9	1.2	0.56J	3.9	2.6	5.4J	3.1J	6.4
Pesticide											
Aldrin	0.22 J	0.054 JN	0.014 J	0.045 J	0.028 JN	0.058 J	0.072	0.057 J	0.12 J	0.057 J	0.10 EJ
Dieldrin	ND(0.010U)	R	0.010 J	ND(0.010UJ)	R	ND(0.010U)	R	R	R	R	R
Heptachlor Epoxide	0.011	0.021 J	0.013 J	0.023 J	R	0.035	0.048	0.034	0.069 J	0.030	0.066
gamma-Chlordane	0.0066 JN	0.018 JN	0.0086 J	R	0.0078 JN	R	R	0.018 JN	R	0.018 JN	R
alpha-Chlordane	ND(0.0050U)	0.0079	0.0079 J	0.0064 J	ND(0.0050UJ)	0.0050 JN	0.0095 J	0.011	0.017 J	0.0095	0.021
trans-Nonachlor	ND(0.0050U)	R	0.010 J	R	ND(0.0050UJ)	R	R	R	R	R	R
cis-Nonachlor	0.0057 J	0.021	0.0054 JN	0.0069 JN	ND(0.0050UJ)	0.0072 JN	0.018	0.018	0.024 J	R	0.034
4,4'-DDT	ND(0.010U)	R	0.012 JN	R	ND(0.010UJ)	ND(0.010U)	R	R	R	R	R
4,4'-DDE	0.031 J	0.11	0.085 J	0.059 J	0.031 J	0.039 J	0.099	0.10	0.16 J	0.096	0.17 EJ
4,4'-DDD	0.011	0.037	0.025 J	0.027 J	0.013 J	0.017	0.036	0.036	0.052 J	0.044	0.076
TAL											
Total Mercury	0.10	0.09	0.13	0.08	0.06	0.03	0.05	0.03	0.05	0.06	0.12

See notes on page 3.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 7 - FISH

Golden Redhorse Whole Body Samples											
Sample Number:	K40291W	K40292W	K40293W	K40294W	K40295W	K40296W	K40297W	K40298W	K40299W	K40300W	K40301W
Sample Date:	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93
PCB											
Aroclor 1016	ND(0.10UJ)	ND(0.10UJ)	ND(0.25U)	ND(0.10U)	ND(0.10U)	ND(0.10U)	ND(0.10U)	0.87	1.1	0.86	0.87
Aroclor 1242	ND(0.10UJ)	ND(0.10UJ)	ND(0.25U)	1.2	ND(0.10U)	0.85	ND(0.10U)	ND(0.10U)	ND(0.10U)	ND(0.10U)	ND(0.10U)
Aroclor 1248	0.90 J	0.95 J	1.7	ND(0.10U)	1.3	ND(0.10U)	1.3	ND(0.10U)	ND(0.10U)	ND(0.10U)	ND(0.10U)
Aroclor 1254	0.56 J	0.56 J	0.87	1.3	0.75	1.0	0.83	1.1	1.5	1.2	1.6
Aroclor 1260	ND(0.10UJ)	ND(0.10UJ)	0.25	ND(0.10U)	0.19	ND(0.10U)	ND(0.10U)	ND(0.10U)	ND(0.10U)	ND(0.10U)	ND(0.10U)
Total PCB	1.5J	1.5J	2.8	2.5	2.2	1.9	2.1	2.0	2.6	2.1	2.5
Pesticide											
Aldrin	0.037 J	0.047	0.054 J	0.053 J	0.050 J	0.045 J	0.053 J	0.053 J	0.055 J	0.045 J	0.058 J
Dieldrin	0.012 JN	0.013 JN	0.017 J	0.017 JN	0.013 JN	0.012 JN	0.015 JN	R	ND(0.010U)	ND(0.010U)	ND(0.010U)
Heptachlor Epoxide	0.032 J	0.044	0.046	0.044	0.045 JN	0.042 JN	0.048 J	0.048 J	R	0.044 J	R
alpha-Chlordane	ND(0.0050UJ)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	0.0093
4,4'-DDE	0.030 J	0.045 J	0.064 J	0.070 J	0.056 J	0.056 J	0.059 J	0.055 J	0.066 J	0.069	0.080 J
4,4'-DDD	ND(0.010UJ)	0.019	0.027	0.030	0.022	0.021	0.025	0.021	0.020	0.026	0.024
TAL											
Total Mercury	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.02	0.02	0.02	0.02

Notes:

¹ Showing only the results for compounds/analytes detected above the quantitation limit.

² Skin-on, scale-on fillets.

³ Skin-off fillets.

E - The compound was quantitated above the calibration range.

J - The compound/analyte was positively identified; however, the associated numerical value is an estimated concentration only.

N - For PCB and Pesticides, the analysis indicates the presence of a compound for which there is presumptive evidence to make a tentative identification.

For Total Mercury, spiked sample recovery not within control limits.

R - The sample results were rejected.

U - The compound was analyzed for but not detected. The associated value is the compound quantitation limit.

UJ - The compound was not detected above the sample quantitation limit. However, the reported limit is approximate and may or may not represent the actual limit of quantitation.

NA - Sample not analyzed.

ND - Not detected.

TABLE 3-36

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
ABSA 7 - FISH

Smallmouth Bass Samples ¹											
Sample Number:	K40276	K40277	K40278	K40279	K40280	K40281	K40282	K40287	K40288	K40289	K40290
Sample Date:	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93
Field Data											
Gender	Female	Male	Female	Female	Male	Female	Male	Male	Male	Female	Female
Length (cm)	33	34	38	37	44	41	38	38	31	30	36
Whole Body Weight (g)	400	500	700	600	1100	900	700	700	300	300	500
Laboratory Data											
Fillet % Lipids	0.50	0.69	1.34	0.51	1.92	1.42	1.05	0.26	0.56	0.50	0.74
Rem. Carc. % Lipids	2.20	3.40	4.70	1.50	4.10	5.30	3.80	2.93	3.28	2.91	3.93
Fillet Weight (g)	159	204	258	225	447	302	275	273	174	144	220
Total PCB (mg/kg)											
Fillet	1.7	1.7	1.9	0.54	3.7J	1.4	2.0	0.39	1.2J	0.72	1.1
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calculated Whole Body	5.2	5.7	5.0	1.2	6.2	4.0	4.9	2.8	3.7	2.6	3.7
Lipid-adjusted PCB (mg/kg-lipid)											
Fillet	340	250	150	110	190	100	180	150	210	140	150
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carp Samples ²											
Sample Number:	K40268	K40269	K40270	K40271	K40272	K40273	K40274	K40275	K40284	K40285	K40286
Sample Date:	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93
Field Data											
Gender	Female	Female	Female	Female	Female	Female	Female	Female	Male	Female	Female
Length (cm)	62	64	61	55	49	50	47	49	48	63	58
Whole Body Weight (g)	2900	3600	3600	2100	1500	1500	1300	1700	1400	3300	2400
Laboratory Data											
Fillet % Lipids	0.80	1.06	3.88	1.78	0.90	0.94	2.76	2.51	2.16	2.01	6.84
Rem. Carc. % Lipids	0.70	0.96	4.30	4.90	1.30	3.60	7.60	6.60	10.4	2.62	12.3
Fillet Weight (g)	748	839	635	586	463	438	364	547	405	680	606
Total PCB (mg/kg)											
Fillet	0.99	2.8	0.71	1.9	1.2	0.56J	3.9	2.6	5.4J	3.1J	6.4
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calculated Whole Body	0.90	2.5	0.77	4.3	1.6	1.7	8.7	5.5	19	3.8	10
Lipid-adjusted PCB (mg/kg-lipid)											
Fillet	120	250	18	110	130	60	140	100	250	160	94
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

See notes on page 2.

TABLE 3-36

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
ABSA 7 - FISH

Golden Redhorse Whole Body Samples											
Sample Number:	K40291W	K40292W	K40293W	K40294W	K40295W	K40296W	K40297W	K40298W	K40299W	K40300W	K40301W
Sample Date:	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93	10/12/93
Field Data											
Gender	Male	Female	Male	Male	Female	Male	Male	Male	Male	Female	Male
Length (cm)	30	30	29	30	28	26	27	18	16	16	15
Whole Body Weight (g)	300	300	200	300	200	200	200	56	36	36	35
Laboratory Data											
% Lipids	3.39	2.22	3.80	4.12	2.66	2.38	3.21	2.91	3.15	3.25	2.61
Total PCB (mg/kg)											
	1.5J	1.5J	2.8	2.5	2.2	1.9	2.1	2.0	2.6	2.1	2.5
Lipid-adjusted PCB (mg/kg-lipid)											
	44	68	74	61	81	79	66	69	81	64	96

Notes:¹ Skin-on, scale-on fillets.² Skin-off fillets.

J - The compound/analyte was positively identified; however, the associated numerical value is an estimated concentration only.

NA - Not analyzed.

TABLE 3-37

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 8 - FISH

Smallmouth Bass Fillet Samples ²											
Sample Number:	K40302	K40303	K40304	K40305	K40306	K40307	K40308	K40309	K40310	K40323	K40324
Sample Date:	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93
PCB											
Aroclor 1016	0.44	0.71	ND(0.25U)	ND(0.25U)	ND(0.10U)	0.38	0.63	ND(0.25U)	0.72 J	0.22	0.31
Aroclor 1242	ND(0.10U)	ND(0.25U)	ND(0.25U)	ND(0.25U)	ND(0.10U)	ND(0.25U)	ND(0.25U)	ND(0.25U)	ND(0.25UJ)	ND(0.050U)	ND(0.10U)
Aroclor 1248	ND(0.10U)	ND(0.25U)	ND(0.25U)	2.1	ND(0.10U)	ND(0.25U)	ND(0.25U)	ND(0.25U)	ND(0.25UJ)	ND(0.050U)	ND(0.10U)
Aroclor 1254	1.2	1.6	1.3	1.6	1.1	1.0	1.9	1.3	1.3 J	0.52	0.76
Aroclor 1260	0.13	0.20 J	0.21 J	0.49	0.45	0.13 J	0.22 J	0.28	0.15 J	ND(0.050U)	0.089 J
Total PCB	1.8	2.5J	1.5J	4.2	1.6	1.5J	2.8J	1.6	2.2J	0.74	1.2J
Pesticide											
Aldrin	0.026 JN	0.038 J	0.026 J	0.054 JN	0.013 JN	0.027 J	0.041 J	0.023 J	0.036 J	0.017 J	0.021 J
Heptachlor Epoxide	0.023	0.033	0.020	0.043	0.010	0.022	0.037	0.017	0.029	0.019	0.019
trans-Nonachlor	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	R	ND(0.0050U)	ND(0.0050U)	R	0.0060 J	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)
cis-Nonachlor	ND(0.0050U)	ND(0.0050U)	0.0090 JN	0.023	ND(0.0050U)	ND(0.0050U)	0.017 J	0.013 J	0.013 J	ND(0.0050U)	ND(0.0050U)
4,4'-DDE	0.042 J	0.062 J	0.042	0.10	0.064	0.045 J	0.081	0.054 J	0.057 J	0.020 J	0.033 J
4,4'-DDD	ND(0.010U)	0.016	ND(0.010U)	0.024	ND(0.010U)	ND(0.010U)	0.019	ND(0.010U)	0.014	ND(0.010U)	ND(0.010U)
TAL											
Total Mercury	0.11 JN	0.11 JN*	0.24 JN*	0.23 JN*	0.33 JN*	0.07 JN*	0.15 JN*	0.24 JN*	0.12 JN*	0.36 JN*	0.09 JN*
Smallmouth Bass Remaining Carcass Samples											
Sample Number:	K40302	K40303	K40304	K40305	K40306	K40307	K40308	K40309	K40310	K40323	K40324
Sample Date:	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93
PCB											
Aroclor 1016	NA	NA	ND(1.5U)	ND(0.75U)	ND(1.0UJ)	NA	ND(0.75UJ)	ND(1.5UJ)	3.4 J	NA	NA
Aroclor 1242	NA	NA	ND(1.5U)	ND(0.75U)	ND(1.0UJ)	NA	ND(0.75UJ)	ND(1.5UJ)	ND(0.75UJ)	NA	NA
Aroclor 1248	NA	NA	ND(1.5U)	2.8	ND(1.0UJ)	NA	2.2 J	ND(1.5UJ)	ND(0.75UJ)	NA	NA
Aroclor 1254	NA	NA	11	3.4	9.0 J	NA	4.0 J	8.0 J	6.4 J	NA	NA
Aroclor 1260	NA	NA	2.2	0.97	4.1 J	NA	0.80 J	1.8 J	0.64 J	NA	NA
Total PCB	NA	NA	13	7.2	13J	NA	7.0J	9.8J	10J	NA	NA
Pesticide											
2-bromobiphenyl	NA	NA	0.095	ND(0.010U)	ND(0.010U)	NA	ND(0.010U)	ND(0.010U)	ND(0.010U)	NA	NA
Aldrin	NA	NA	0.22 DJ	0.10 DJN	0.041 JN	NA	0.11 DJN	0.079 JN	0.12 DJ	NA	NA
Heptachlor Epoxide	NA	NA	0.18 D	0.078	0.036	NA	0.098 D	0.066	0.11 D	NA	NA
trans-Nonachlor	NA	NA	0.042	R	ND(0.0050U)	NA	ND(0.010U)	R	R	NA	NA
cis-Nonachlor	NA	NA	0.11 DJ	0.036	ND(0.0050U)	NA	0.042	0.072 J	0.051	NA	NA
4,4'-DDE	NA	NA	0.44 D	0.18 D	0.33 D	NA	0.22 D	0.30 D	0.23 D	NA	NA
4,4'-DDD	NA	NA	0.093	0.048	0.021	NA	0.053	0.042	0.061	NA	NA
TAL											
Total Mercury	NA	NA	0.16 JN*	0.23 JN*	0.33 JN*	NA	0.10 JN*	0.19 JN*	0.05 JN*	NA	NA

See notes on page 3.

TABLE 3-37

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 8 - FISH

Carp Fillet Samples ³											
Sample Number:	K40315	K40316	K40317	K40318	K40319	K40320	K40321	K40322	K40325	K40326	K40327
Sample Date:	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93
PCB											
Aroclor 1016	ND(0.25U)	ND(0.25U)	0.34	ND(0.75UJ)	ND(0.25U)	0.86	ND(1.0U)	0.71	ND(0.25U)	ND(0.50U)	ND(0.50U)
Aroclor 1242	ND(0.25U)	ND(0.25U)	ND(0.10U)	ND(0.75UJ)	ND(0.25U)	ND(0.25U)	ND(1.0U)	ND(0.10U)	ND(0.25U)	ND(0.50U)	ND(0.50U)
Aroclor 1248	1.5	ND(0.25U)	ND(0.10U)	ND(0.75UJ)	ND(0.25U)	ND(0.25U)	7.5	ND(0.10U)	2.4	ND(0.50U)	4.9
Aroclor 1254	0.89	1.9	0.81	4.5 J	3.5 J	1.6	2.1	1.6	1.4	5.4	3.2
Aroclor 1260	0.22 J	0.23 J	0.16	1.2 J	0.68 J	ND(0.25U)	ND(1.0U)	ND(0.10U)	0.36	1.1	1.0
Total PCB	2.6J	2.1J	1.3	5.7J	4.2J	2.5	9.6	2.3	4.2	6.5	9.1
Pesticide											
Aldrin	0.059 J	0.035 JN	0.031 J	0.034 JN	0.036 J	0.037 J	0.26 D	0.045 J	0.065 J	0.066 JN	0.15 DJ
Heptachlor Epoxide	0.026 J	0.015	0.014	0.013	0.018	0.017 J	0.092 J	0.025 J	0.034 J	0.032	0.052 J
gamma-Chlordane	0.017 JN	0.015 JN	0.0094 JN	0.018 JN	0.013 JN	R	R	0.015 JN	R	R	0.049 JN
alpha-Chlordane	0.0067 J	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	0.028	0.0069 J	R	ND(0.0050U)	0.024
cis-Nonachlor	0.019	R	0.0082 JN	ND(0.0050U)	ND(0.0050U)	0.0080 J	0.040	0.013 J	0.011 JN	0.057	0.056
4,4'-DDE	0.070 J	0.065	0.043	0.15	0.054 J	0.031 J	0.13 J	0.066 J	0.046 J	0.19 DJ	0.21 DJ
4,4'-DDD	0.026	0.011 J	0.011	0.022	0.011	0.013 J	0.076	0.021 J	0.013 J	0.047	0.091
TAL											
Total Mercury	0.08	0.12	0.09	0.15 JN*	0.30 JN*	0.12 JN*	0.03 JN*	0.07	0.12	0.13 JN*	0.14 JN*
Carp Remaining Carcass Samples											
Sample Number:	K40315	K40316	K40317	K40318	K40319	K40320	K40321	K40322	K40325	K40326	K40327
Sample Date:	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93
PCB											
Aroclor 1016	NA	NA	NA	ND(0.50UJ)	ND(0.50U)	2.3	ND(1.0U)	NA	NA	ND(1.0U)	ND(1.0U)
Aroclor 1242	NA	NA	NA	ND(0.50UJ)	ND(0.50U)	ND(0.50U)	ND(1.0U)	NA	NA	ND(1.0U)	ND(1.0U)
Aroclor 1248	NA	NA	NA	ND(0.50UJ)	ND(0.50U)	ND(0.50U)	1.2	NA	NA	ND(1.0U)	7.7
Aroclor 1254	NA	NA	NA	3.9 J	4.7	4.7	3.1	NA	NA	7.5	5.0
Aroclor 1260	NA	NA	NA	1.1 J	0.98	ND(0.50U)	ND(1.0U)	NA	NA	1.6	1.6
Total PCB	NA	NA	NA	5.0J	5.7	7.0	4.3	NA	NA	9.1	14
Pesticide											
Aldrin	NA	NA	NA	0.031 J	0.10 DJ	0.13 D	0.39 DJ	NA	NA	0.049 JN	0.27 DJ
Heptachlor Epoxide	NA	NA	NA	0.011 J	0.051	0.067	0.17 DJ	NA	NA	0.020 J	ND(0.0050U)
gamma-Chlordane	NA	NA	NA	0.017 JN	R	R	R	NA	NA	0.025 JN	0.071 JN
alpha-Chlordane	NA	NA	NA	ND(0.0050U)	ND(0.0050U)	0.021	0.045	NA	NA	ND(0.0050UJ)	0.037
cis-Nonachlor	NA	NA	NA	ND(0.0050U)	0.037 JN	0.034	0.054	NA	NA	0.038 J	0.079
4,4'-DDE	NA	NA	NA	0.13	0.16	0.013	0.22 DJ	NA	NA	0.13 J	0.35 DJ
4,4'-DDD	NA	NA	NA	0.021	0.039	0.061	0.12	NA	NA	0.031 J	0.14
TAL											
Total Mercury	NA	NA	NA	0.10 JN*	0.20 JN*	0.10 JN*	0.25 JN*	NA	NA	0.07 JN*	0.070 JN*

See notes on page 3.

TABLE 3-37

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 8 - FISH

White Sucker Whole Body Samples											
Sample Number:	K40328W	K40329W	K40330W	K40331W	K40332W	K40333W	K40334W	K40335W	K40336W	K40337W	K40338W
Sample Date:	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93
PCB											
Aroclor 1016	ND(0.050U)	ND(0.050U)	ND(0.10U)	ND(0.10U)	ND(0.10U)	ND(0.050U)	ND(0.10U)	ND(0.10U)	ND(0.050U)	ND(0.050U)	0.30
Aroclor 1242	ND(0.050U)	ND(0.050U)	ND(0.10U)	ND(0.10U)	ND(0.10U)	ND(0.050U)	ND(0.10U)	ND(0.10U)	ND(0.050U)	ND(0.050U)	ND(0.10U)
Aroclor 1248	ND(0.050U)	0.12	ND(0.10U)	ND(0.10U)	ND(0.10U)	0.23	ND(0.10U)	ND(0.10U)	ND(0.050U)	ND(0.050U)	ND(0.10U)
Aroclor 1254	0.48	0.091	0.92	0.84	0.72	0.19	0.99	0.90	0.52	0.76	0.76
Aroclor 1260	0.067	0.030 J	0.094 J	0.12	0.14	0.043 J	0.14	0.11	0.087	0.10	0.12
Total PCB	0.55	0.24J	1.0J	0.96	0.86	0.46J	1.1	1.0	0.61	0.86	1.2
Pesticide¹											
Aldrin	0.0091 JN	0.014 JN	0.0065 J	0.011 JN	0.012 JN	0.011 J	0.015 JN	0.017 JN	0.013 J	0.014 JN	0.019 J
Heptachlor Epoxide	0.0052 J	0.0090 J	0.0050 JN	0.011	R	0.011 J	0.011	0.013	0.0090	0.012 J	0.016 JN
gamma-Chlordane	ND(0.0050U)	0.0066 JN	ND(0.0050U)	0.0061 JN	R	ND(0.0050U)	R	0.0079 JN	0.0051 JN	R	R
4,4'-DDE	0.017 J	0.029 J	ND(0.010U)	0.028 J	0.022 J	0.011 J	0.034 J	0.031 J	0.015 J	0.027 J	0.027 J
TAL											
Total Mercury	0.04	0.06	0.05	0.04	0.02	0.08	0.03	0.02	0.04	0.03	0.03

Notes:¹ Showing only the results for compounds/analytes detected above the quantitation limit.² Skin-on, scale-on fillets.³ Skin-off fillets.

D - Concentration is based on a diluted sample analysis.

J - The compound/analyte was positively identified; however, the associated numerical value is an estimated concentration only.

N - For PCB and Pesticides, the analysis indicates the presence of a compound for which there is presumptive evidence to make a tentative identification.

For Total Mercury, spiked sample recovery not within control limits.

R - The sample results were rejected.

U - The compound was analyzed for but not detected. The associated value is the compound quantitation limit.

UJ - The compound was not detected above the sample quantitation limit. However, the reported limit is approximate and may or may not represent the actual limit of quantitation.

* - Duplicate analysis not within control limit.

NA - Sample not analyzed.

ND - Not detected.

TABLE 3-38

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
ABSA 8 - FISH

Smallmouth Bass Samples ¹											
Sample Number:	K40302	K40303	K40304	K40305	K40306	K40307	K40308	K40309	K40310	K40323	K40324
Sample Date:	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93
Field Data											
Gender	Male	Female	Male	Female	Male	Male	Female	Male	Female	Female	Male
Length (cm)	33	38	35	35	34	31	30	33	30	38	32
Whole-body Weight (g)	400	600	500	500	500	300	300	400	300	670	450
Laboratory Data											
Fillet % Lipids	0.58	1.11	0.96	1.63	0.36	0.78	1.59	0.52	1.19	0.34	0.61
Rem. Carc. % Lipids	3.70	4.3	5.78	3.01	1.50	2.0	3.60	1.84	4.11	0.83	2.73
Fillet Weight (g)	180	227	231	163	186	148	142	144	131	174	147
Total PCB (mg/kg)											
Fillet	1.8	2.5J	1.5J	4.2	1.6	1.5J	2.8J	1.6	2.2J	0.74	1.2J
Remaining Carcass	NA	NA	13	7.2	13J	NA	7.0J	9.8J	10J	NA	NA
Calculated Whole Body	7.1	7.0	11	6.6	11	2.7	5.6	7.8	7.4	1.5	3.9
Lipid-adjusted PCB (mg/kg-lipid)											
Fillet	310	230	160	260	440	190	180	310	180	220	200
Remaining Carcass	NA	NA	220	240	870	NA	190	540	240	NA	NA

See notes on page 3.

TABLE 3-38

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
ABSA 8 - FISH

Carp Samples ²											
Sample Number:	K40315	K40316	K40317	K40318	K40319	K40320	K40321	K40322	K40325	K40326	K40327
Sample Date:	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93
Field Data											
Gender	Female	Female	Female	Male	Female	Male	Female	Female	Female	Male	Female
Length (cm)	56	65	69	55	55	48	52	48	62	63	67
Whole-body Weight (g)	2200	3500	3800	2200	2000	1500	1700	1500	3100	2900	2800
Laboratory Data											
Fillet % Lipids	0.97	0.66	0.51	1.05	0.86	2.24	5.65	1.32	0.60	1.04	3.07
Rem. Carc. % Lipids	2.53	1.29	1.18	1.01	2.25	4.88	8.77	4.21	0.92	3.08	4.82
Fillet Weight (g)	549	710	837	548	400	273	199	281	715	135	610
Total PCB (mg/kg)											
Fillet	2.6J	2.1J	1.3	5.7J	4.2J	2.5	9.6	2.3	4.2	6.5	9.1
Remaining Carcass	NA	NA	NA	5.0J	5.7	7.0	4.3	NA	NA	9.1	14
Calculated Whole Body	5.7	3.7	2.7	5.0	5.6	6.7	4.6	6.5	5.9	8.9	14
Lipid-adjusted PCB (mg/kg-lipid)											
Fillet	270	320	250	520	490	110	170	180	700	650	290
Remaining Carcass	NA	NA	NA	500	250	140	50	NA	NA	290	290

See notes on page 3.

TABLE 3-38

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
ABSA 8 - FISH

White Sucker Whole Body Samples											
Sample Number:	K40328W	K40329W	K40330W	K40331W	K40332W	K40333W	K40334W	K40335W	K40336W	K40337W	K40338W
Sample Date:	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93	10/13/93
Field Data											
Gender	Female	Female	Female	Male	Male	Male	Male	Male	Male	Male	Male
Length (cm)	25	26	23	29	21	21	19	20	19	20	19
Whole-body Weight (g)	150	190	130	260	120	90	70	80	70	80	70
Laboratory Data											
% Lipids	0.73	0.71	0.76	0.66	0.85	0.88	0.83	0.59	0.55	1.01	1.29
Total PCB (mg/kg)											
	0.55	0.24J	1.0J	0.96	0.86	0.46J	1.1	1.0	0.61	0.86	1.2
Lipid-adjusted PCB (mg/kg-lipid)											
	75	34	130	150	100	52	130	170	110	86	92

Notes:¹ Skin-on, scale-on fillets.² Skin-off fillets.

J - The compound/analyte was positively identified; however, the associated numerical value is an estimated concentration only.

NA - Not analyzed.

TABLE 3-39

**ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE**

BIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 9 - FISH

Smallmouth Bass Fillet Samples ²											
Sample Number:	K40130	K40131	K40132	K40133	K40134	K40135	K40136	K40137	K40138	K40139	K40140
Sample Date:	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93
PCB											
Aroclor 1016	ND(0.10U)	ND(0.25U)	ND(0.25U)	ND(0.50U)	0.64 J	ND(0.50U)	ND(0.25U)	ND(0.25U)	ND(0.50U)	1.7 J	ND(0.10U)
Aroclor 1242	0.50	1.1	1.6	3.5	ND(0.25UJ)	2.3	2.1	0.98	1.4	ND(0.25UJ)	0.70
Aroclor 1248	ND(0.10U)	ND(0.25U)	ND(0.25U)	ND(0.50U)	ND(0.25UJ)	ND(0.50U)	ND(0.25U)	ND(0.25U)	ND(0.50U)	ND(0.25UJ)	ND(0.10U)
Aroclor 1254	1.1	2.5	1.8	2.2	1.5 J	3.5	1.1	1.2	2.0	1.3 J	0.88
Aroclor 1260	0.16	0.45	ND(0.25U)	ND(0.50U)	ND(0.25UJ)	ND(0.50U)	ND(0.25U)	ND(0.25U)	ND(0.50U)	ND(0.25UJ)	ND(0.10U)
Total PCB	1.8	4.1	3.4	5.7	2.1J	5.8	3.2	2.2	3.4	3.0J	1.6
Pesticide											
Aldrin	0.027 JN	0.050 JN	0.064 JN	0.073 JN	0.033 JN	0.11 DJN	0.049 JN	0.040 JN	0.052 JN	0.049 JN	0.026 JN
Dieldrin	ND(0.010U)	R	R	ND(0.010U)	ND(0.010UJ)	0.070	ND(0.010U)	ND(0.010U)	ND(0.010U)	0.015 JN	ND(0.010U)
Heptachlor Epoxide	0.027	0.046	0.056	0.069	0.030 J	0.089 DJ	0.051	0.036	ND(0.0050U)	ND(0.0050U)	0.020
gamma-Chlordane	R	ND(0.0050U)	R	R	R	R	R	R	0.021 JN	R	0.0094 JN
alpha-Chlordane	ND(0.0050U)	0.0084	0.0064 J	ND(0.0050U)	ND(0.0050UJ)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	0.0061 J	0.0053	ND(0.0050U)
cis-Nonachlor	0.011 J	0.025 J	0.016 J	ND(0.0050U)	0.013 J	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	0.013	ND(0.0050U)
4,4'-DDT	R	R	R	R	R	0.041 JN	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)
4,4'-DDE	0.054	0.12	0.093	0.11	0.062 J	0.19 DJ	0.066	0.061	0.093	0.067	0.036
4,4'-DDD	ND(0.010U)	0.021 J	0.027	0.046	0.016 J	ND(0.010U)	0.023	0.017	0.024	0.022	ND(0.010U)
TAL											
Total Mercury	0.24	0.11	0.22	0.24	0.17 JN	0.20	0.14	0.20	0.23	0.10 JN	0.12

See notes on page 3.

TABLE 3-39

**ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE**

BIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 9 - FISH

Smallmouth Bass Remaining Carcass Samples											
Sample Number:	K40130	K40131	K40132	K40133	K40134	K40135	K40136	K40137	K40138	K40139	K40140
Sample Date:	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93
PCB											
Aroclor 1016	NA	NA	NA	ND(0.75U)	NA	ND(0.75UJ)	ND(0.75U)	ND(0.50U)	ND(0.75U)	NA	ND(0.75UJ)
Aroclor 1242	NA	NA	NA	7.2	NA	2.7 J	8.2	2.4	3.9	NA	2.4 J
Aroclor 1248	NA	NA	NA	ND(0.75U)	NA	ND(0.75UJ)	ND(0.75U)	ND(0.50U)	ND(0.75U)	NA	ND(0.75UJ)
Aroclor 1254	NA	NA	NA	4.5	NA	4.4 J	5.0	2.8	6.0	NA	3.5 J
Aroclor 1260	NA	NA	NA	ND(0.75U)	NA	ND(0.75UJ)	ND(0.75U)	ND(0.50U)	ND(0.75U)	NA	ND(0.75UJ)
Total PCB	NA	NA	NA	12	NA	7.1J	13	5.2	9.9	NA	5.9J
Pesticide											
2-bromobiphenyl	NA	NA	NA	ND(0.030 UDJ)	NA	ND(0.020 UDJ)	0.12 JN	ND(0.020 UDJ)	0.10 JN	NA	0.050 JN
Aldrin	NA	NA	NA	0.18 DJN	NA	0.13 DJN	0.25 DJN	0.090 DJN	0.15 DJN	NA	0.12 DJN
Heptachlor Epoxide	NA	NA	NA	0.17 DJ	NA	0.11 DJ	0.20 DJ	0.083 DJ	0.13 DJ	NA	0.072 J
gamma-Chlordane	NA	NA	NA	0.057	NA	0.040 JN	R	0.035	R	NA	R
alpha-Chlordane	NA	NA	NA	ND(0.0050U)	NA	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	0.019	NA	0.012
4,4'-DDE	NA	NA	NA	0.25 DJ	NA	0.24 DJ	0.28 DJ	0.14 DJ	0.29 DJ	NA	0.15
4,4'-DDD	NA	NA	NA	0.11	NA	0.060	0.11	0.055	0.083	NA	0.049
TAL											
Total Mercury	NA	NA	NA	0.19	NA	0.17	0.08	0.10	0.16	NA	0.10
Carp Fillet Samples³											
Sample Number:	K40119	K40120	K40121	K40122	K40123	K40124	K40125	K40126	K40127	K40128	K40129
Sample Date:	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93
PCB											
Aroclor 1016	ND(0.050UJ)	ND(0.10UJ)	ND(0.10U)	ND(0.10U)	ND(0.25U)	ND(0.050U)	ND(0.10U)	ND(0.050U)	ND(0.10U)	ND(0.10U)	ND(0.10U)
Aroclor 1242	ND(0.050UJ)	ND(0.10UJ)	ND(0.10U)	ND(0.10U)	ND(0.25U)	ND(0.050U)	ND(0.10U)	ND(0.050U)	ND(0.10U)	ND(0.10U)	ND(0.10U)
Aroclor 1248	0.44 J	0.57 J	ND(0.10U)	1.2	3.8	0.30	1.1	ND(0.050U)	0.83	ND(0.10U)	0.23
Aroclor 1254	0.50 J	0.55 J	0.93	1.1	2.7	0.32	1.1	0.077	0.94	0.94	0.68
Aroclor 1260	0.078 J	0.12 J	0.14	0.20	ND(0.25U)	0.066	0.15	0.022 J	0.16	0.14	0.073 J
Total PCB	1.0J	1.2J	1.1	2.5	6.5	0.69	2.4	0.099J	1.9	1.1	0.98J
Pesticide											
Aldrin	0.021 JN	0.021 JN	0.020 JN	0.036 JN	0.12 JN	0.013 JN	0.036 JN	ND(0.0050U)	0.027 JN	R	0.017 JN
Heptachlor Epoxide	0.012 J	0.010 J	0.0085 J	0.017 J	0.071	0.0067	0.016 J	ND(0.0050U)	0.011 J	0.0078	0.0085
gamma-Chlordane	R	R	0.0082 JN	0.014 JN	R	ND(0.0050U)	0.015 JN	ND(0.0050U)	0.011 JN	0.0081 J	R
alpha-Chlordane	ND(0.0050UJ)	ND(0.0050UJ)	ND(0.0050U)	0.0051	R	ND(0.0050U)	0.0052	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)
cis-Nonachlor	0.0056 J	0.0070 J	R	0.012	0.024	ND(0.0050U)	0.012	ND(0.0050U)	0.0090	0.0072 JN	0.0065 J
4,4'-DDE	0.026 J	0.032 J	0.038 J	0.054 J	0.095 J	0.020	0.049 J	ND(0.010U)	0.044	0.033 J	0.029 J
4,4'-DDD	0.010 J	ND(0.10UJ)	0.010	0.018	0.040	ND(0.010U)	0.018	ND(0.010U)	0.012	ND(0.010U)	ND(0.010U)
TAL											
Total Mercury	0.30	0.14	0.23	0.20	0.20	0.18	0.23	0.10	0.14	0.16	0.11

See notes on page 3.

TABLE 3-39

**ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE**

**BIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 9 - FISH**

White Sucker Whole Body Samples											
Sample Number:	K40141W	K40142W	K40143W	K40144W	K40145W	K40146W	K40147W	K40148W	K40149W	K40150W	K40151W
Sample Date:	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93
PCB											
Aroclor 1016	0.15	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	0.20	ND(0.050U)	ND(0.10U)	ND(0.050U)	ND(0.050U)	ND(0.050U)
Aroclor 1242	ND(0.050U)	0.23	0.60	0.21	0.15	ND(0.050U)	ND(0.050U)	ND(0.10U)	0.21	0.18	0.13
Aroclor 1248	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	1.1	ND(0.050U)	ND(0.050U)	ND(0.050U)
Aroclor 1254	0.36	0.59	0.70	0.39	0.31	0.66	0.53	0.60	0.32	0.34	0.34
Aroclor 1260	ND(0.050U)	0.10	0.11	0.062	0.091	0.056	0.063	ND(0.10U)	0.072	0.032 J	0.085
Total PCB	0.51	0.92	1.4	0.66	0.55	0.92	0.59	1.7	0.60	0.55J	0.56
Pesticide											
Aldrin	0.010 JN	R	0.022 JN	R	0.0088 JN	R	0.011 JN	0.022 JN	0.012 JN	0.013 JN	0.0096 JN
Heptachlor Epoxide	0.0095	0.017 JN	R	R	0.0053 JN	R	R	R	R	R	R
gamma-Chlordane	ND(0.0050U)	R	0.0093 JN	ND(0.0050U)	ND(0.0050U)	0.0050 JN	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)
4,4'-DDE	0.012 J	0.026 J	0.035	0.012 J	0.013	0.021	0.016 J	0.038	0.019 J	0.017	0.016
4,4'-DDD	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	0.011	ND(0.010U)	ND(0.010U)	ND(0.010U)
TAL											
Total Mercury	0.04	0.04	0.03	0.05	0.04	0.04	0.03	0.03	0.03	0.03	0.04

Notes:¹ Showing only the results for compounds/analytes detected above the quantitation limit.² Skin-on, scale-on fillets.³ Skin-off fillets.

D - Concentration is based on a diluted sample analysis.

J - The compound/analyte was positively identified; however, the associated numerical value is an estimated concentration only.

N - For PCB and Pesticides, the analysis indicates the presence of a compound for which there is presumptive evidence to make a tentative identification.

For Total Mercury, spiked sample recovery not within control limits.

R - The sample results were rejected.

U - The compound was analyzed for but not detected. The associated value is the compound quantitation limit.

UJ - The compound was not detected above the sample quantitation limit. However, the reported limit is approximate and may or may not represent the actual limit of quantitation.

NA - Sample not analyzed.

ND - Not detected.

TABLE 3-40

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
ABSA 9 - FISH

Smallmouth Bass Samples ¹											
Sample Number:	K40130	K40131	K40132	K40133	K40134	K40135	K40136	K40137	K40138	K40139	K40140
Sample Date:	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93
Field Data											
Gender	Female	Female	Female	Female	Male	Male	Male	Female	Male	Male	Female
Length (cm)	45	38	38	38	38	37	35	35	33	29	30
Whole Body Weight (g)	1300	740	770	850	800	680	600	630	430	350	280
Laboratory Data											
Fillet % Lipids	1.85	4.71	4.06	3.65	2.37	4.26	2.33	2.23	1.66	3.27	1.23
Rem. Carc. % Lipids	3.94	2.92	8.57	7.53	5.62	5.62	9.24	5.38	5.65	8.78	5.89
Fillet Weight (g)	661	395	443	341	320	369	260	273	199	171	135
Total PCB (mg/kg)											
Fillet	1.8	4.1	3.4	5.7	2.1J	5.8	3.2	2.2	3.4	3.0J	1.6
Remaining Carcass	NA	NA	NA	12	NA	7.1J	13	5.2	9.9	NA	5.9J
Calculated Whole Body	2.7	3.4	5.0	11	3.8	6.9	11	4.7	8.4	5.6	4.4
Lipid-adjusted PCB (mg/kg-lipid)											
Fillet	95	87	83	150	88	130	140	100	200	91	130
Remaining Carcass	NA	NA	NA	160	NA	130	140	97	170	NA	100

See notes on page 3.

TABLE 3-40

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
ABSA 9 - FISH

Carp Samples ²											
Sample Number:	K40119	K40120	K40121	K40122	K40123	K40124	K40125	K40126	K40127	K40128	K40129
Sample Date:	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93
Field Data											
Gender	Female	Female	Female	Female	Male	Female	Male	Female	Male	Male	Female
Length (cm)	48	46	47	47	44	48	45	48	46	44	45
Whole Body Weight (g)	1600	1100	1300	1300	1100	1500	1100	1000	1400	1200	1100
Laboratory Data											
Fillet % Lipids	2.03	2.76	1.60	2.79	0.83	1.03	1.00	0.38	1.00	0.53	1.11
Rem. Carc. % Lipids	3.90	4.25	4.24	3.90	9.40	1.65	4.15	0.68	3.66	1.97	4.82
Fillet Weight (g)	426	275	278	365	360	275	286	152	278	319	248
Total PCB (mg/kg)											
Fillet	1.0J	1.2J	1.1	2.5	6.5	0.69	2.4	0.099J	1.9	1.1	0.98J
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calculated Whole Body	1.7	1.7	4.7	5.1	17	1.3	8.1	0.2	6.0	3.3	3.5
Lipid-adjusted PCB (mg/kg-lipid)											
Fillet	50	43	130	160	230	83	240	26	190	210	89
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

See notes on page 3.

TABLE 3-40

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
ABSA 9 - FISH

White Sucker Whole Body Samples											
Sample Number:	K40141W	K40142W	K40143W	K40144W	K40145W	K40146W	K40147W	K40148W	K40149W	K40150W	K40151W
Sample Date:	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93	09/16/93
Field Data											
Gender	Female	Male	Male	Female	Female	Female	Male	Female	Male	Male	Male
Length (cm)	20	21	20	20	18	20	20	19	19	18	17
Whole Body Weight (g)	76	95	81	81	71	82	73	64	63	69	53
Laboratory Data											
% Lipids	0.72	0.66	0.66	0.67	0.73	0.68	0.68	1.23	0.66	0.79	0.77
Total PCB (mg/kg)											
	0.51	0.92	1.4	0.66	0.55	0.92	0.59	1.7	0.60	0.55J	0.56
Lipid-adjusted PCB (mg/kg-lipid)											
	71	140	210	99	75	140	87	140	91	70	73

Notes:¹ Skin-on, scale-on fillets.² Skin-off fillets.

J - The compound/analyte was positively identified; however, the associated numerical value is an estimated concentration only.

NA - Not analyzed.

TABLE 3-41

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITEBIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 10 - FISH

Smallmouth Bass Fillet Samples ²											
Sample Number:	K40159	K40160	K40161	K40162	K40163	K40164	K40165	K40166	K40171	K40172	K40173
Sample Date:	09/21/93	09/21/93	09/21/93	09/21/93	09/21/93	09/21/93	09/21/93	09/21/93	10/01/93	10/01/93	10/01/93
PCB											
Aroclor 1016	ND(0.25U)	ND(0.10U)	ND(0.25U)	0.55	0.46	0.62	ND(0.10U)	ND(0.10U)	0.41	ND(0.10U)	ND(0.10U)
Aroclor 1242	1.0	ND(0.10U)	0.83	ND(0.25U)	ND(0.10U)	ND(0.25U)	ND(0.10U)	0.87	ND(0.10U)	1.1	0.91
Aroclor 1248	ND(0.25U)	0.36	ND(0.25U)	ND(0.25U)	ND(0.10U)	ND(0.25U)	0.70	ND(0.10U)	ND(0.10U)	ND(0.10U)	ND(0.10U)
Aroclor 1254	1.2	0.69	1.4	1.4	1.1	1.8	0.77	0.85	1.2	1.3	1.2
Aroclor 1260	ND(0.25U)	ND(0.10U)	ND(0.25U)	ND(0.25U)	ND(0.10U)	ND(0.25U)	ND(0.10U)	ND(0.10U)	0.089 J	ND(0.10U)	ND(0.10U)
Total PCB	2.2	1.1	2.2	2.0J	1.6	2.4	1.5	1.7	1.7J	2.4	2.1
Pesticide											
Aldrin	0.042 JN	R	0.040 JN	R	R	R	R	R	R	0.042 JN	0.045 JN
Dieldrin	0.017 J	ND(0.010U)	R	R	ND(0.010U)	ND(0.010U)	R	ND(0.010U)	ND(0.010U)	R	R
Heptachlor Epoxide	0.043	0.028	0.046	0.030	0.028	0.052	0.043	0.030	ND(0.0050U)	0.046	0.050
gamma-Chlordane	R	R	0.016 JN	R	R	0.018 JN	0.016 JN	0.011 JN	R	R	R
alpha-Chlordane	0.0070	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)
cis-Nonachlor	0.011 J	0.0083 JN	0.012 JN	0.010 JN	0.0080 JN	0.014 JN	0.015	0.012	0.0086 JN	0.012 JN	0.012 JN
4,4'-DDT	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	0.010	ND(0.010U)	ND(0.010U)	ND(0.010U)
4,4'-DDE	0.083	0.055 J	0.087	0.070	0.056 J	0.12	0.070 J	0.053 J	0.071	0.082	0.086
4,4'-DDD	0.022	ND(0.010U)	0.019	ND(0.010U)	0.012	0.016	0.011	ND(0.010U)	0.011	0.016	0.018
TAL											
Total Mercury	0.17 JN	0.10 JN	0.16 JN	0.09 JN	0.10 JN	0.13 JN	0.04 JN	0.07 JN	0.17 JN	0.09 JN	0.11 JN

See notes on page 3.

TABLE 3-41

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 10 - FISH

Carp Fillet Samples ³											
Sample Number:	K40152	K40153	K40154	K40155	K40156	K40157	K40158	K40167	K40168	K40169	K40170
Sample Date:	09/21/93	09/21/93	09/21/93	09/21/93	09/21/93	09/21/93	09/21/93	10/01/93	10/01/93	10/01/93	10/01/93
PCB											
Aroclor 1016	ND(0.75U)	ND(0.50U)	ND(1.5U)	ND(0.25U)	ND(0.25U)	ND(0.50U)	ND(0.10U)	ND(0.50U)	ND(0.50U)	ND(0.25U)	ND(0.25U)
Aroclor 1242	ND(0.75U)	ND(0.50U)	ND(1.5U)	ND(0.25U)	ND(0.25U)	ND(0.50U)	ND(0.10U)	ND(0.50U)	ND(0.50U)	ND(0.25U)	ND(0.25U)
Aroclor 1248	3.6	ND(0.50U)	ND(1.5U)	1.4	ND(0.25U)	3.7	0.71	5.3	7.5	ND(0.25U)	ND(0.25U)
Aroclor 1254	9.7	5.2	14	2.5	3.5	3.6	1.1	4.0	3.5	1.8	2.5
Aroclor 1260	1.1	1.2	3.0	0.46	0.58	0.63	0.12	1.2	1.2	0.25 J	0.29
Total PCB	14	6.4	17	4.4	4.1	7.9	1.9	11	12	2.1J	2.8
Pesticide											
Hexachlorobenzene	ND(0.015U)	ND(0.015U)	ND(0.0050U)	ND(0.0050U)	ND(0.010U)	ND(0.015U)	ND(0.0050U)	ND(0.025 UD)	ND(0.050 UD)	ND(0.010 UD)	0.0096 JN
Aldrin	R	R	ND(0.0050U)	R	R	0.13 JN	R	0.12 DJN	0.25 DJ	0.054 J	0.042 J
Dieldrin	R	R	ND(0.010U)	ND(0.020 UD)	R	R	ND(0.010U)	0.15	0.31 D	0.10	0.16
Heptachlor Epoxide	0.084 JN	R	ND(0.0050U)	ND(0.0050U)	R	0.083	0.018	0.091 D	0.20 D	0.058	0.046
gamma-Chlordane	0.065 JN	0.032 JN	ND(0.0050U)	0.029 JN	R	R	0.010 JN	0.078 J	0.18 DJN	0.033 JN	0.035 J
alpha-Chlordane	0.026	ND(0.15U)	ND(0.0050U)	0.012 J	0.012	0.020	ND(0.0050U)	0.11 D	0.25 D	0.047	0.051
trans-Nonachlor	R	R	ND(0.0050U)	R	R	R	ND(0.0050U)	0.11 DJ	0.24 D	0.049 J	0.050 J
cis-Nonachlor	0.073 J	0.051 J	ND(0.0050U)	0.029 DJ	0.032 J	0.040 J	0.011 J	0.056	0.11 D	0.028 JN	0.029 J
4,4'-DDT	R	R	0.038	R	R	R	ND(0.010U)	R	R	R	R
4,4'-DDE	0.47	0.41	ND(0.010U)	0.18 D	0.23	0.27	0.060	0.60 D	1.0 D	0.20 DJ	0.29 DJ
4,4'-DDD	0.053	0.021 JN	ND(0.010U)	0.034	0.022 J	0.042 J	0.010	0.14	0.26 D	0.066	0.066
TAL											
Total Mercury	0.21	0.27	0.42	0.13	0.18	0.13	0.13	0.12	0.14	0.10 JN	0.09 JN

See notes on page 3.

TABLE 3-41

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 10 - FISH

Spotted Sucker Whole Body Samples											
Sample Number:	K40217W	K40218W	K40219W	K40220W	K40221W	K40222W	K40223W	K40224W	K40225W	K40226W	K40227W
Sample Date:	10/09/93	10/09/93	10/09/93	10/09/93	10/09/93	10/09/93	10/09/93	10/09/93	10/09/93	10/09/93	10/09/93
PCB											
Aroclor 1016	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050UJ)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)
Aroclor 1242	ND(0.050U)	0.18	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050UJ)	0.066	0.031 J	ND(0.050U)	ND(0.050U)
Aroclor 1248	ND(0.050U)	ND(0.050U)	0.26	0.030 J	ND(0.050U)	0.64	ND(0.050UJ)	ND(0.050U)	ND(0.050U)	ND(0.050U)	0.15
Aroclor 1254	0.083	0.17	0.22	0.068	0.25	0.28	0.15 J	0.17	0.17	0.12	0.43
Aroclor 1260	0.051	0.068	0.050	0.039 J	0.031 J	ND(0.050U)	0.022 J	0.030 J	ND(0.050U)	0.047 J	ND(0.050U)
Total PCB	0.13	0.42	0.53	0.14J	0.28J	0.92	0.17J	0.27J	0.20J	0.17J	0.58
Pesticide											
Heptachlor Epoxide	ND(0.0050UJ)	0.0058	0.0075 JN	ND(0.0050UJ)	ND(0.0050UJ)	ND(0.0050UJ)	ND(0.0050UJ)	ND(0.0050UJ)	ND(0.0050UJ)	ND(0.0050UJ)	ND(0.0050U)
4,4'-DDE	ND(0.010UJ)	0.013 J	0.016 JN	ND(0.010UJ)	0.013 J	0.019 J	0.013 J	ND(0.010UJ)	ND(0.010UJ)	0.012 J	0.016
TAL											
Total Mercury	0.04	0.04	0.03	0.02	0.03	0.04	0.03	0.03	0.04	0.04	0.05

Notes:

¹ Showing only the results for compounds/analytes detected above the quantitation limit.

² Skin-on, scale-on fillets.

³ Skin-off fillets.

D - Concentration is based on a diluted sample analysis.

J - The compound/analyte was positively identified; however, the associated numerical value is an estimated concentration only.

N - For PCB and Pesticides, the analysis indicates the presence of a compound for which there is presumptive evidence to make a tentative identification. For Total Mercury, spiked sample recovery not within control limits.

R - The sample results were rejected.

U - The compound was analyzed for but not detected. The associated value is the compound quantitation limit.

UJ - The compound was not detected above the sample quantitation limit. However, the reported limit is approximate and may or may not represent the actual limit of quantitation.

NA - Sample not analyzed.

ND - Not detected.

TABLE 3-42

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
ABSA 10 - FISH

Smallmouth Bass Samples ¹											
Sample Number:	K40159	K40160	K40161	K40162	K40163	K40164	K40165	K40166	K40171	K40172	K40173
Sample Date:	09/21/93	09/21/93	09/21/93	09/21/93	09/21/93	09/21/93	09/21/93	09/21/93	10/01/93	10/01/93	10/01/93
Field Data											
Gender	Female	Female	Female	Male	Female	Male	Male	Female	Female	Female	Female
Length (cm)	42	37	41	34	35	31	31	31	41	37	33
Whole Body Weight (g)	1300	630	980	580	600	450	420	400	840	700	480
Laboratory Data											
Fillet % Lipids	2.65	0.87	1.59	1.71	0.93	1.93	2.68	1.69	1.19	2.20	2.00
Rem. Carc. % Lipids	10.6	2.40	4.10	5.20	4.80	4.90	5.60	10.50	4.88	4.70	6.80
Fillet Weight (g)	513	283	441	274	249	212	191	183	348	305	213
Total PCB (mg/kg)											
Fillet	2.2	1.1	2.2	2.0J	1.6	2.4	1.5	1.7	1.7J	2.4	2.1
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calculated Whole Body	6.3	2.2	4.1	4.2	5.5	4.4	2.4	6.8	4.8	3.9	4.9
Lipid-adjusted PCB (mg/kg-lipid)											
Fillet	81	130	140	120	170	130	56	100	140	110	110
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carp Samples ²											
Sample Number:	K40152	K40153	K40154	K40155	K40156	K40157	K40158	K40167	K40168	K40169	K40170
Sample Date:	09/21/93	09/21/93	09/21/93	09/21/93	09/21/93	09/21/93	09/21/93	10/01/93	10/01/93	10/01/93	10/01/93
Field Data											
Gender	Female	Female	Female	Female	Female	Female	Female	Male	Female	Female	Female
Length (cm)	54	61	58	52	49	52	52	75	85	75	74
Whole Body Weight (g)	2200	2900	2800	2200	1900	2100	1800	7300	11000	8700	7500
Laboratory Data											
Fillet % Lipids	4.05	2.07	2.87	2.60	2.56	4.52	1.00	18.8	30.7	20.2	24.8
Rem. Carc. % Lipids	6.31	3.81	2.16	3.31	11.4	11.4	3.02	23.9	23.5	24.7	28.3
Fillet Weight (g)	457	464	709	493	378	609	513	1976	3323	2670	2323
Total PCB (mg/kg)											
Fillet	14	6.4	17	4.4	4.1	7.9	1.9	11	12	2.1J	2.8
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calculated Whole Body	20	11	31	5.3	15	16	4.6	13	10	2.5	3.0
Lipid-adjusted PCB (mg/kg-lipid)											
Fillet	340	300	590	170	160	180	190	58	39	11	11
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

See notes on page 2.

TABLE 3-42

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
ABSA 10 - FISH

Spotted Sucker Whole Body Samples											
Sample Number:	K40217W	K40218W	K40219W	K40220W	K40221W	K40222W	K40223W	K40224W	K40225W	K40226W	K40227W
Sample Date:	10/09/93	10/09/93	10/09/93	10/09/93	10/09/93	10/09/93	10/09/93	10/09/93	10/09/93	10/09/93	10/09/93
Field Data											
Gender	Male	Male	Male	Male	Male	Male	Male	Male	Male	Female	Male
Length (cm)	24	23	19	27	27	29	27	27	29	30	30
Whole Body Weight (g)	140	120	60	230	240	290	230	220	290	360	330
Laboratory Data											
% Lipids	0.88	1.08	1.11	1.07	0.99	0.83	1.66	0.54	1.16	0.81	0.85
Total PCB (mg/kg)											
	0.13	0.42	0.53	0.14J	0.28J	0.92	0.17J	0.27J	0.20J	0.17J	0.58
Lipid-adjusted PCB (mg/kg-lipid)											
	15	38	48	13	28	110	10	50	17	21	68

Notes:¹ Skin-on, scale-on fillets.² Skin-off fillets.

J - The compound/analyte was positively identified; however, the associated numerical value is an estimated concentration only.

NA - Not analyzed.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 11 - FISH

Smallmouth Bass Fillet Samples ²											
Sample Number:	K40190	K40191	K40196	K40197	K40198	K40199	K40200	K40213	K40214	K40215	K40216
Sample Date:	10/06/93	10/06/93	10/07/93	10/07/93	10/07/93	10/07/93	10/07/93	10/08/93	10/08/93	10/08/93	10/08/93
PCB											
Aroclor 1016	ND(0.050U)	0.23	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)
Aroclor 1242	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)
Aroclor 1248	0.21	ND(0.050U)	0.26	0.27	0.35	0.27	0.20	0.038 J	ND(0.050U)	ND(0.050U)	ND(0.050U)
Aroclor 1254	0.45	0.58	0.19	0.21	0.24	0.17	0.27	0.24	0.48	0.10	0.79
Aroclor 1260	0.17	ND(0.050U)	0.028 J	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	0.033 J	0.096	0.030 J	ND(0.050U)
Total PCB	0.83	0.81	0.48J	0.48	0.59	0.44	0.47	0.31J	0.58	0.13J	0.79
Pesticide											
Aldrin	R	R	0.010 JN	0.010 JN	0.0096 JN	R	R	0.0059 JN	0.022 JN	ND(0.0050U)	R
Heptachlor Epoxide	0.013	0.016	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	0.0071	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	0.012
gamma-Chlordane	R	R	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	0.0062 JN
trans-Nonachlor	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	0.0081 J	ND(0.0050U)	ND(0.0050U)
cis-Nonachlor	0.0063 JN	0.0071	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	R	ND(0.0050U)	0.0075 J
4,4'-DDE	0.067	0.035 J	0.018 J	0.013 J	0.014 J	0.020	0.014 J	0.015 J	0.063	0.013	0.049
TAL											
Total Mercury	0.09 JN	0.04 JN	0.04 JN*	0.12 JN*	0.07 JN*	0.06 JN*	0.09 JN*	0.13 JN*	0.07 JN*	0.33 JN*	0.19 JN*
Carp Fillet Samples ³											
Sample Number:	K40179	K40180	K40181	K40182	K40183	K40184	K40185	K40186	K40187	K40188	K40189
Sample Date:	10/06/93	10/06/93	10/06/93	10/06/93	10/06/93	10/06/93	10/06/93	10/06/93	10/06/93	10/06/93	10/06/93
PCB											
Aroclor 1016	ND(0.25U)	ND(0.25U)	ND(0.25U)	ND(0.10U)	ND(0.75U)	ND(0.25U)	ND(0.75U)	ND(0.25U)	ND(0.75U)	ND(0.75U)	ND(0.50U)
Aroclor 1242	ND(0.25U)	ND(0.25U)	ND(0.25U)	ND(0.10U)	ND(0.75U)	ND(0.25U)	ND(0.75U)	ND(0.25U)	ND(0.75U)	ND(0.75U)	ND(0.50U)
Aroclor 1248	ND(0.25U)	ND(0.25U)	2.2	ND(0.10U)	ND(0.75U)	ND(0.25U)	ND(0.75U)	ND(0.25U)	ND(0.75U)	ND(0.75U)	ND(0.50U)
Aroclor 1254	1.9	2.6	1.3	1.1	8.5	2.3	8.7	3.0	7.9	7.7	3.1
Aroclor 1260	0.26	0.29	ND(0.25U)	0.29	ND(0.75U)	0.28	ND(0.75U)	ND(0.25U)	0.98	1.4	0.62
Total PCB	2.2	2.9	3.5	1.4	8.5	2.6	8.7	3.0	8.9	9.1	3.7
Pesticide											
2-bromobiphenyl	R	R	ND(0.010U)	R	ND(0.010UJ)	R	0.054 J	ND(0.010UJ)	ND(0.010UJ)	ND(0.010UJ)	ND(0.010UJ)
Hexachlorobenzene	ND(0.0050U)	0.012 JN	ND(0.0050U)	0.0087 JN	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)
Aldrin	0.035 JN	0.034	0.059 JN	0.023 JN	R	0.045 JN	0.11 JN	0.053 JN	R	0.088 EJN	R
Dieldrin	0.073	0.18 DJ	R	0.13	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)	ND(0.010U)
Heptachlor Epoxide	0.031	0.049 J	0.058	0.029 J	0.053	0.036	0.10	0.041	0.031	0.079	0.064 DJN
gamma-Chlordane	R	0.063	R	0.042	R	R	R	R	0.038 DJN	0.048	R
alpha-Chlordane	0.023	0.11 DJ	0.013 J	0.060	0.017	0.010	0.026	0.011	0.018	0.026	ND(0.0050UJ)
trans-Nonachlor	0.026 JN	0.11 DJ	R	0.063	R	R	R	R	ND(0.0050U)	ND(0.0050U)	0.024 DJ
cis-Nonachlor	0.032	0.042 J	0.020 J	0.30	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)	0.023 J	ND(0.0050U)	ND(0.0050U)	ND(0.0050U)
4,4'-DDE	0.16	0.33 DEJ	0.12	0.27 DJ	0.55 DJ	0.13	0.38 DJ	0.13	0.30 DJ	0.34 DEJ	0.22 DJ
4,4'-DDD	0.038	0.11	0.030	0.095	0.069	0.025	0.069	0.031	0.032	0.058	0.038
TAL											
Total Mercury	0.08 JN	0.10 JN	0.23 JN	0.09 JN	0.22 JN	0.20 JN	0.13 JN	0.16 JN	0.26 JN	0.20 JN	0.21 JN

See notes on page 2.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC BIOTA CLP TCL/TAL ANALYSES RESULTS (mg/kg)¹
ABSA 11 - FISH

White Sucker Whole Body Samples											
Sample Number:	K40202W	K40203W	K40204W	K40205W	K40206W	K40207W	K40208W	K40209W	K40210W	K40211W	K40212W
Sample Date:	10/07/93	10/07/93	10/07/93	10/07/93	10/07/93	10/07/93	10/07/93	10/07/93	10/07/93	10/07/93	10/07/93
PCB											
Aroclor 1016	ND(0.17U)	ND(0.050U)	ND(0.048U)	ND(0.097U)	ND(0.049U)	ND(0.049U)	ND(0.10U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)
Aroclor 1242	0.81	ND(0.050U)	ND(0.048U)	ND(0.097U)	ND(0.049U)	ND(0.049U)	ND(0.10U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	0.36
Aroclor 1248	ND(0.17U)	0.53	0.74	0.62	0.47	0.59	0.49	0.62	0.53	0.77	ND(0.050U)
Aroclor 1254	0.80	0.37	0.37	0.33	0.44	0.46	0.29	0.58	0.50	0.46	0.74
Aroclor 1260	ND(0.17U)	ND(0.050U)	ND(0.048U)	ND(0.097U)	ND(0.049U)	ND(0.049U)	ND(0.10U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)
Total PCB	1.6	0.90	1.1	0.95	0.91	1.1	0.78	1.2	1.0	1.2	1.1
Pesticide											
Aldrin	0.043 J	0.017 JN	0.020 JN	R	0.018 JN	0.024 JN	0.024 JN	R	R	0.026 JN	R
Heptachlor Epoxide	R	0.018	0.023	0.023	0.022	0.024	0.027	0.021	0.023	0.031	0.019
4,4'-DDE	0.037 J	0.023 J	0.026	0.030	0.025	0.028 J	0.032 J	0.033	0.027	0.031 J	0.029
TAL											
Total Mercury	0.03	R	0.03	0.03	0.05	0.03	0.03	0.04	0.03	0.03	0.03

Notes:

¹ Showing only the results for compounds/analytes detected above the quantitation limit.

² Skin-on, scale-on fillets.

³ Skin-off fillets.

D - Concentration is based on a diluted sample analysis.

E - The compound was quantitated above the calibration range.

J - The compound/analyte was positively identified; however, the associated numerical value is an estimated concentration only.

UJ - The compound was analyzed for but not detected. The associated value is the compound quantitation limit.

The compound was positively identified; however, the associated numerical value is an estimated concentration only.

R - The sample results were rejected.

U - The compound was analyzed for but not detected. The associated value is the compound quantitation limit.

N - For PCB and Pesticides, the analysis indicates the presence of a compound for which there is presumptive evidence to make a tentative identification. For Total Mercury, spiked sample recovery not within control limits.

NA - Sample not analyzed.

ND - Not detected.

TABLE 3-44

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
ABSA 11 - FISH

Smallmouth Bass Samples											
Sample Number:	K40190	K40191	K40196	K40197	K40198	K40199	K40200	K40213	K40214	K40215	K40216
Sample Date:	10/06/93	10/06/93	10/07/93	10/07/93	10/07/93	10/07/93	10/07/93	10/08/93	10/08/93	10/08/93	10/08/93
Field Data											
Gender	Male	Male	Male	Male	Female	Female	Male	Male	Male	Female	Male
Length (cm)	26	26	29	27	27	26	26	32	27	36	42
Whole Body Weight (g)	200	220	340	220	250	200	170	480	290	800	1100
Laboratory Data											
Fillet % Lipids	0.92	1.11	1.37	0.52	0.94	0.80	0.69	0.66	1.06	0.73	0.73
Rem. Carc. % Lipids	3.36	6.43	8.80	4.50	11.3	9.80	3.00	4.00	7.00	5.50	5.00
Fillet Weight (g)	92	112	154	106	107	93	88	131	102	264	417
Total PCB (mg/kg)											
Fillet	0.83	0.81	0.48J	0.48	0.59	0.44	0.47	0.31J	0.58	0.13J	0.79
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calculated Whole Body	2.0	2.8	1.9	2.3	4.1	3.1	1.2	1.5	2.6	0.70	3.6
Lipid-adjusted PCB (mg/kg-lipid)											
Fillet	90	74	34	92	63	55	68	47	53	18	110
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carp Samples											
Sample Number:	K40179	K40180	K40181	K40182	K40183	K40184	K40185	K40186	K40187	K40188	K40189
Sample Date:	10/06/93	10/06/93	10/06/93	10/06/93	10/06/93	10/06/93	10/06/93	10/06/93	10/06/93	10/06/93	10/06/93
Field Data											
Gender	Male	Female	Female	Female	Female	Male	Male	Female	Male	Male	Female
Length (cm)	66	76	61	71	62	55	55	51	50	51	48
Whole Body Weight (g)	4600	8500	3700	5600	3700	2100	2300	1800	1700	1700	1700
Laboratory Data											
Fillet % Lipids	10.1	22.2	6.75	17.9	4.9	2.37	7.0	4.0	2.66	7.5	4.23
Rem. Carc. % Lipids	19.0	31.5	7.2	25.9	4.80	7.10	10.3	11.4	10.1	8.2	8.00
Fillet Weight (g)	1625	2760	907	1404	789	584	642	434	512	454	318
Total PCB (mg/kg)											
Fillet	2.2	2.9	3.5	1.4	8.5	2.6	8.7	3.0	8.9	9.1	3.7
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calculated Whole Body	3.5	3.8	3.7	1.9	8.4	6.3	11	7.0	26	9.7	6.4
Lipid-adjusted PCB (mg/kg-lipid)											
Fillet	22	13	51	7.8	170	110	120	75	330	120	88
Remaining Carcass	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

See notes on page 2.

TABLE 3-44

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CALCULATED WHOLE BODY PCB CONCENTRATIONS
ABSA 11 - FISH

White Sucker Whole Body Samples											
Sample Number:	K40202W	K40203W	K40204W	K40205W	K40206W	K40207W	K40208W	K40209W	K40210W	K40211W	K40212W
Sample Date:	10/07/93	10/07/93	10/07/93	10/07/93	10/07/93	10/07/93	10/07/93	10/07/93	10/07/93	10/07/93	10/07/93
Field Data											
Gender	Female	Male	Female	Male	Female	Male	Male	Male	Male	Male	Male
Length (cm)	28	27	24	23	24	23	23	23	24	22	21
Whole Body Weight (g)	220	200	140	110	140	110	110	110	140	110	84
Laboratory Data											
% Lipids	2.96	1.22	2.37	1.87	2.39	4.41	2.23	1.11	1.27	3.24	1.34
Total PCB (mg/kg)	1.6	0.90	1.1	0.95	0.91	1.1	0.78	1.2	1.0	1.2	1.1
Lipid-adjusted PCB (mg/kg-lipid)	53	75	46	50	38	25	35	110	77	38	85

Notes:¹ Skin-on, scale-on fillets.² Skin-off fillets.

J - The compound/analyte was positively identified; however, the associated numerical value is an estimated concentration only.

NA - Not analyzed.

Allied Paper, Inc./Portage Creek/Kalamazoo
Superfund Site

Fish Investigation
Summary of Analytical Results - Aroclor (mg/kg), Total PCB (mg/kg), Percent Lipids
ABSA 1 – Upstream of Battle Creek

Carp Fillet Samples ¹											
Sample Number	K40640	K40641	K40643	K40644	K40645	K40646	K40647	K40648	K40649	K40650	K40651
Sample Date	11/10/97	11/10/97	11/10/97	11/10/97	11/10/97	11/10/97	11/10/97	11/10/97	11/10/97	11/10/97	11/10/97
Aroclor 1254	0.046 J	0.058	0.073	0.060	0.039 J	0.073	0.094	0.079	0.035 J	0.20	0.047 J
Aroclor 1260	ND(0.050U)	ND(0.050U)	0.030 J	ND(0.050U)	ND(0.050U)	ND(0.050U)	0.029 J	0.037 J	ND(0.050U)	0.066	ND(0.050U)
Total PCB ³	0.046 J	0.058	0.10 J	0.060	0.039 J	0.073	0.12 J	0.12 J	0.035 J	0.27	0.047 J
% Lipid	0.7	0.6	0.7	0.4	0.5	0.9	1.3	0.7	0.3	1.5	0.7
Smallmouth Bass Fillet Samples ²											
Sample Number	K40623	K40624	K40625	K40626	K40627	K40628	K40635	K40636	K40637	K40638	K40639
Sample Date	10/28/97	10/28/97	10/28/97	10/28/97	10/28/97	10/28/97	10/29/97	10/29/97	10/29/97	10/29/97	10/29/97
Aroclor 1254	0.048 J	0.080	ND(0.050U)	ND(0.050U)	0.037 J	0.056	0.075	0.046 J	0.052	0.027 J	ND(0.050U)
Aroclor 1260	ND(0.050U)	ND(0.050U)	0.027 J	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	0.043 J
Total PCB ³	0.048 J	0.080	0.027 J	ND(0.050U)	0.037 J	0.056	0.075	0.046 J	0.052	0.027 J	0.043 J
% Lipid	0.3	0.9	0.5	0.3	0.6	0.2	0.7	0.8	0.4	0.4	0.4

Notes:

¹ Skin-off fillets

² Skin-on, scale-on fillets

³ Wet-weight PCB concentration

J The compound was positively identified; however, the associated value is an estimated concentration only.

N The analysis indicate(s) the presence of compound for which there is presumptive evidence to make a tentative identification.

U The compound was analyzed for, but not detected. The associated value is the compound quantitation limit.

UJ The compound was not detected above the sample quantitation limit. However, the reported limit is approximate and may not represent the actual limit of quantitation.

ND Not detected

Allied Paper, Inc./Portage Creek Kalamazoo
Superfund Site

Fish Investigation
Summary of Analytical Results - Aroclor (mg/kg), Total PCB (mg/kg), Percent Lipid
ABSA 2 - Morrow Lake

Carp Fillet Samples ¹											
Sample Number	K40521	K40522	K40523	K40525	K40526	K40552	K40553	K40554	K40555	K40556	K40557
Sample Date	10/15/97	10/15/97	10/15/97	10/15/97	10/15/97	10/20/97	10/20/97	10/20/97	10/20/97	10/20/97	10/20/97
Aroclor 1254	0.028 J	0.13 J	ND(0.15UJ)	0.073 J	0.15 J	ND(0.15UJ)	0.087 J	0.19 J	0.31 J	0.52 J	0.14 J
Aroclor 1260	0.033 J	0.026 J	ND(0.15U)	0.030 J	0.038 J	0.27 JN	0.034 J	0.46 J	0.080 J	0.10 J	0.032 J
Total PCB ³	0.061 J	0.16 J	ND(0.15U)	0.10 J	0.19 J	0.27 JN	0.12 J	0.65 J	0.39 J	0.62 J	0.17 J
% Lipid	0.3	0.3	0.3	0.2	0.4	0.4	0.2	1.0	0.6	0.8	0.3
Smallmouth Bass Fillet Samples ²											
Sample Number	K40527	K40528	K40529	K40558	K40559	K40560	K40561	K40562	K40563	K40615	K40617
Sample Date	10/15/97	10/15/97	10/15/97	10/20/97	10/20/97	10/20/97	10/20/97	10/20/97	10/20/97	10/28/97	10/28/97
Aroclor 1254	0.28 J	0.12 J	0.11 J	0.072	0.028 J	0.078	0.10	0.044 J	0.083	0.034 J	0.040 J
Aroclor 1260	0.063 J	0.035 J	ND(0.050UJ)	ND(0.050U)	ND(0.050U)	ND(0.049U)	0.072	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050UJ)
Total PCB ³	0.34 J	0.16 J	0.11 J	0.072	0.028 J	0.078	0.17	0.044 J	0.083	0.034 J	0.040 J
% Lipid	0.8	0.3	0.4	0.6	0.2	0.4	0.3	0.4	0.3	0.3	1.2

Notes:

- ¹ Skin-off fillets
² Skin-on, scale-on fillets
³ Wet-weight PCB concentration
J The compound was positively identified; however, the associated value is an estimated concentration only.
N The analysis indicate the presence of compound for which there is presumptive evidence to make a tentative identification.
U The compound was analyzed for, but not detected. The associated value is the compound quantitation limit.
UJ The compound was not detected above the sample quantitation limit. However, the reported limit is approximate and may not represent the actual limit of quantitation.
ND Not detected

Allied Paper, Inc./Portage Creek Kalamazoo
Superfund Site

Fish Investigation
Summary of Analytical Results - Aroclor (mg/kg), Total PCB (mg/kg), Percent Lipid
ABSA 5 - Plainwell Dam

Carp Fillet Samples ¹											
Sample Number	K40584	K40585	K40586	K40587	K40588	K40589	K40591	K40592	K40593	K40594	K40595
Sample Date	10/23/97	10/23/97	10/23/97	10/23/97	10/23/97	10/23/97	10/23/97	10/23/97	10/23/97	10/23/97	10/23/97
Aroclor 1242	ND(1.0UJ)	ND(0.50UJ)	ND(0.50UJ)	ND(0.25UJ)	0.58 J	ND(0.10UJ)	ND(0.15UJ)	ND(0.10UJ)	ND(0.15UJ)	ND(0.10UJ)	ND(0.50UJ)
Aroclor 1248	12 J	3.8 J	7.8 J	2.0 J	0.62 J	1.4 J	0.92 J	0.50 J	0.56 J	0.65 J	7.5 J
Aroclor 1254	4.6 J	3.0 J	3.8 J	1.9 J	1.9 J	0.86 J	0.93 J	0.62 J	0.65 J	0.64 J	5.6 J
Aroclor 1260	0.74 J	0.37 J	ND(0.50U)	ND(0.25U)	0.25 J	0.19 J	ND(0.15UJ)	ND(0.10UJ)	0.18 J	ND(0.10UJ)	0.68 J
Total PCB ³	17 J	7.2 J	12 J	3.9 J	3.4 J	2.5 J	1.9 J	1.1 J	1.4 J	1.3 J	14 J
% Lipid	14.0	8.8	10.0	3.0	5.3	1.6	1.1	0.50	1.3	2.2	14.8
Smallmouth Bass Fillet Samples ²											
Sample Number	K40596	K40597	K40598	K40599	K40600	K40601	K40602	K40603	K40605	K40606	K40607
Sample Date	10/23/97	10/23/97	10/23/97	10/23/97	10/23/97	10/23/97	10/23/97	10/23/97	10/23/97	10/23/97	10/23/97
Aroclor 1242	0.081 J	0.086 J	ND(0.050UJ)	ND(0.050UJ)	ND(0.25UJ)	ND(0.10UJ)	0.039 J	ND(0.10U)	ND(0.050U)	ND(0.050U)	ND(0.099U)
Aroclor 1248	ND(0.050UJ)	ND(0.050UJ)	ND(0.050UJ)	0.068 J	0.38 J	0.20 J	0.089 J	ND(0.10U)	0.10	0.25	ND(0.099U)
Aroclor 1254	0.23 J	0.37 J	0.090 J	0.061 J	0.88 J	0.48 J	0.14 J	0.30	0.13	0.15	0.42
Aroclor 1260	0.033 J	0.043 J	ND(0.050UJ)	ND(0.050UJ)	0.16 J	0.083 J	ND(0.050UJ)	0.057 J	0.032 J	0.044 J	0.066 J
Total PCB ³	0.34 J	0.50 J	0.090 J	0.13 J	1.4 J	0.76 J	0.27 J	0.36 J	0.26 J	0.44 J	0.49 J
% Lipid	0.2	0.3	0.1	0.2	0.6	0.4	0.2	0.1	0.3	0.3	0.2

Notes:

¹ Skin-off fillets

² Skin-on, scale-on fillets

³ Wet-weight PCB concentration

J The compound was positively identified; however, the associated value is an estimated concentration only.

N The analysis indicate the presence of compound for which there is presumptive evidence to make a tentative identification.

U The compound was analyzed for, but not detected. The associated value is the compound quatitation limit.

UJ The compound was not detected above the sample quatitation limit. However, the reported limit is approximate and may not represent the actual limit of quatitation.

ND Not detected

Allied Paper, Inc./Portage Creek Kalamazoo
Superfund Site

Fish Investigation
Summary of Analytical Results - Aroclor (mg/kg), Total PCB (mg/kg), Percent Lipid
ABSA 9 - Lake Allegan

Carp Fillet Samples ¹											
Sample Number	K40535	K40536	K40537	K40538	K40539	K40568	K40569	K40570	K40571	K40572	K40574
Sample Date	10/17/97	10/17/97	10/17/97	10/17/97	10/17/97	10/21/97	10/21/97	10/21/97	10/21/97	10/21/97	10/21/97
Aroclor 1242	ND(0.25UJ)	ND(0.050UJ)	ND(0.10UJ)	ND(0.050UJ)	ND(0.10UJ)	ND(0.050UJ)	ND(0.25UJ)	ND(0.15UJ)	ND(0.050UJ)	ND(0.050UJ)	ND(0.049U)
Aroclor 1248	0.60 J	0.12 J	ND(0.10UJ)	0.13 J	0.32 J	0.11 J	ND(0.25UJ)	ND(0.15UJ)	0.15 J	0.19 J	0.13
Aroclor 1254	0.70 J	0.16 J	0.35 J	ND(0.050UJ)	0.65 J	0.14 J	1.4 J	0.73 J	0.37 J	0.30 J	0.23
Aroclor 1260	0.19 J	0.076 J	0.095 J	0.13 J	ND(0.10UJ)	0.058 J	0.25 J	0.18 J	0.047 J	0.088 J	0.053
Total PCB ³	1.5 J	0.36 J	0.45 J	0.26 J	0.97 J	0.31 J	1.7 J	0.91 J	0.57 J	0.58 J	0.41
% Lipid	1.6	0.5	0.2	1.6	0.8	0.4	1.1	0.3	0.3	0.4	0.3
Smallmouth Bass Fillet Samples ²											
Sample Number	K40540	K40542	K40575	K40576	K40577	K40578	K40579	K40580	K40581	K40582	K40583
Sample Date	10/17/97	10/17/97	10/21/97	10/21/97	10/21/97	10/21/97	10/21/97	10/21/97	10/21/97	10/22/97	10/22/97
Aroclor 1242	ND(0.15UJ)	ND(0.050UJ)	ND(0.15U)	ND(0.050U)	ND(0.050U)	0.13	ND(0.050U)	0.050 J	ND(0.050U)	ND(0.10U)	ND(0.15U)
Aroclor 1248	0.68 J	0.26 J	ND(0.15U)	0.18	0.14	ND(0.050U)	0.098	ND(0.050U)	0.15	ND(0.10U)	ND(0.15U)
Aroclor 1254	0.90 J	0.17 J	0.23	0.14	0.15	0.25	0.17	0.11	0.16	0.39	0.64
Aroclor 1260	ND(0.15UJ)	0.092 J	ND(0.15UJ)	0.034 J	0.031 J	ND(0.050U)	0.033 J	ND(0.050U)	ND(0.050U)	0.052 J	0.14 J
Total PCB ³	1.6 J	0.52 J	0.23	0.35 J	0.32 J	0.38	0.30 J	0.16 J	0.31	0.44 J	0.78 J
% Lipid	1.3	0.4	0.5	0.6	0.4	0.7	0.3	0.4	0.4	0.2	0.2

Notes:

¹ Skin-off fillets

² Skin-on, scale-on fillets

³ Wet-weight PCB concentration

J The compound was positively identified; however, the associated value is an estimated concentration only.

N The analysis indicate the presence of compound for which there is presumptive evidence to make a tentative identification.

U The compound was analyzed for, but not detected. The associated value is the compound quatitation limit.

UJ The compound was not detected above the sample quatitation limit. However, the reported limit is approximate and may not represent the actual limit of quatitation.

ND Not detected

Table 3-49

Allied Paper, Inc./Portage Creek Kalamazoo
Superfund Site

Fish Investigation
Summary of Analytical Results - Aroclor (mg/kg), Total PCB (mg/kg), Percent Lipid
ABSA 11 - Near Saugatuck

Carp Fillet Samples ¹												
Sample Number	K40505	K40506	K40507	K40508	K40509	K40511	K40512	K40513	K40514	K40515	K40516	K40543
Sample Date	10/14/97	10/14/97	10/14/97	10/14/97	10/14/97	10/14/97	10/14/97	10/14/97	10/14/97	10/14/97	10/14/97	10/16/97
Aroclor 1242	ND(1.0UJ)	ND(0.50UJ)	ND(0.10UJ)	ND(0.50UJ)	3.0 J	ND(0.25UJ)	ND(0.50UJ)	ND(0.050UJ)	ND(0.050UJ)	ND(0.50UJ)	ND(0.25UJ)	ND(0.050UJ)
Aroclor 1248	3.3 J	ND(0.50UJ)	0.47 J	ND(0.50UJ)	ND(1.0UJ)	1.1 J	ND(0.50UJ)	0.33 J	0.53 J	1.5 J	ND(0.25UJ)	0.17 J
Aroclor 1254	6.4 J	3.2 J	0.63 J	4.9 J	13 J	1.5 J	5.2 J	0.31 J	0.37 J	2.1 J	2.0 J	0.15 J
Aroclor 1260	1.4 J	0.29 J	0.18 J	1.0 J	1.3 J	0.34 J	0.81 J	0.080 J	0.071 J	0.56 J	0.35 J	0.043 J
Total PCB ³	11 J	3.5 J	1.3 J	5.9 J	17 J	2.9 J	6.0 J	0.72 J	0.97 J	4.2 J	2.4 J	0.36 J
% Lipid	20.6	16.7	2.1	3.6	10.3	4.2	3.5	5.4	2.8	5.5	1.3	1.4
Smallmouth Bass Fillet Samples ²												
Sample Number	K40500	K40502	K40544	K40545	K40546	K40547	K40548	K40549	K40550	K40613	K40614	
Sample Date	10/14/97	10/14/97	10/16/97	10/16/97	10/16/97	10/16/97	10/16/97	10/16/97	10/16/97	10/27/97	10/27/97	
Aroclor 1242	ND(0.10UJ)	ND(0.050UJ)	ND(0.20UJ)	0.060 J	ND(0.050UJ)	ND(0.20UJ)	0.24 JN	ND(0.15UJ)	ND(0.050UJ)	ND(0.050U)	0.046 J	
Aroclor 1248	0.33 J	0.29 J	0.93 J	ND(0.050UJ)	0.43 J	1.3 J	ND(0.050UJ)	ND(0.15UJ)	0.27 J	0.10	ND(0.050U)	
Aroclor 1254	0.45 J	0.33 J	1.4 J	0.28 J	ND(0.050UJ)	3.0 J	ND(0.050UJ)	1.0 JN	0.23 J	0.090	0.15	
Aroclor 1260	0.094 J	0.059 J	0.29 J	0.044 J	0.11 J	ND(0.20UJ)	0.11 JN	ND(0.15UJ)	0.060 J	0.029 J	ND(0.050U)	
Total PCB ³	0.87 J	0.68 J	2.6 J	0.38 J	0.54 J	4.3 J	0.35 JN	1.0 JN	0.56 J	0.22 J	0.20 J	
% Lipid	0.5	0.6	0.3	0.8	0.7	0.6	0.3	0.7	0.7	0.3	0.2	

Notes:

¹ Skin-off fillets² Skin-on, scale-on fillets³ Wet-weight PCB concentration

J The compound was positively identified; however, the associated value is an estimated concentration only.

N The analysis indicate the presence of compound for which there is presumptive evidence to make a tentative identification.

U The compound was analyzed for, but not detected. The associated value is the compound quantitation limit.

UJ The compound was not detected above the sample quantitation limit. However, the reported limit is approximate and may not represent the actual limit of quantitation.

ND Not detected

TABLE 3-50

ALLIED PAPER, INC/PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF FIELD DATA, LIPID CONTENT, AND MAXIMUM DETECTED PCB CONCENTRATIONS
FOR FISH FILLET AND TURTLE MUSCLE SAMPLES

Location	Sample No.	Length ¹ (cm)	Weight (g)	Lipid Content (percent)	Total PCB ² (mg/kg)
Smallmouth Bass Fillet Samples					
ABSA 1	K40241	38	900	2.3	0.31
ABSA 2	K40026	36	570	1.9	0.67
ABSA 3	K40045	40	730	2.6	3.2
ABSA 4	K40113	31	340	1.1	0.72
ABSA 5	K40353	29	290	1.6	3.9
ABSA 6	K40253	34	630	1.4	3.7
ABSA 7	K40280	44	1100	1.9	3.7 J
ABSA 8	K40305	35	500	1.6	4.2
ABSA 9	K40135	37	680	4.3	5.8
ABSA 10	K40164	31	450	1.9	2.4
ABSA 11	K40190	26	200	0.92	0.83
Carp Fillet Samples					
ABSA 1	K40431 ³	53	2200	1.4	0.057 J
ABSA 2	K40009	69	4600	4.2	1.9
ABSA 3	K40036	65	4000	3.3	8.2
ABSA 4	K40095	60	3200	14	13
ABSA 5	K40361	61	3100	12	17
ABSA 6	K40258	58	2700	2.5	8.0
ABSA 7	K40286	58	2400	6.8	6.4
ABSA 8	K40321	52	1700	5.7	9.6
ABSA 9	K40123	44	1100	2.8	6.5
ABSA 10	K40154	58	2800	2.9	17
ABSA 11	K40188	51	1700	7.5	9.1
Snapping Turtle Muscle Samples					
ABSA 1	K42022	27	4100	0.34	8.1
ABSA 5	K42001	36	12000	0.50	1.9 D
ABSA 10	K42033	29	6200	0.17	0.25

Notes:

¹ - Length : total length of fish, carapace length of turtles.

² - Wet-weight concentration.

³ - Sample K40431 was inadvertently selected in place of sample K40424 which had the highest observed PCB concentration of 0.17 mg/kg

NA - Smallmouth bass were not present in the Portage Creek sampling location.

D - Concentration is based on a diluted sample analysis.

J - The compound/analyte was positively identified; however, the associated numerical value is an estimated concentration only.

TABLE 3-51

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF FISH FILLET PCDD/PCDF RESULTS

Smallmouth Bass Fillet Samples											
Location	ABSA 1	ABSA 2	ABSA 3	ABSA 4	ABSA 5	ABSA 6	ABSA 7	ABSA 8	ABSA 9	ABSA 10	ABSA 11
Sample Number	K40241	K40026	K40045	K40113	K40353	K40253	K40280	K40305	K40135	K40164	K40190
Sample Date	10/10/93	8/25/93	8/26/93	9/11/93	10/14/93	10/11/93	10/12/93	10/13/93	9/16/93	9/21/93	10/06/93
PCDD (mg/kg)											
2,3,7,8-TCDD	ND(3.1E-07UJ)	ND(6.0E-07U)	5.7E-07	7.8E-07	4.7E-06	9.1E-07	4.0E-06	3.6E-07	1.3E-06	ND(8.0E-07U)	4.9E-07
1,2,3,7,8-PeCDD	4.3E-07 J	ND(9.0E-07U)	ND(3.0E-07U)	ND(1.8E-07UJ)	4.4E-07	1.9E-07	3.4E-07	ND(9.0E-08U)	2.3E-07	ND(1.2E-06U)	2.2E-07
1,2,3,4,7,8-HxCDD	ND(3.0E-07U)	ND(8.0E-07U)	ND(4.0E-07U)	ND(2.0E-07U)	ND(4.0E-07U)	ND(2.0E-07U)	ND(4.0E-07U)	ND(1.0E-07U)	ND(2.0E-07U)	ND(1.2E-06U)	ND(2.0E-07U)
1,2,3,6,7,8-HxCDD	ND(2.0E-07U)	ND(7.0E-07U)	ND(3.0E-07U)	2.2E-07	5.5E-07	1.9E-07	3.4E-07	ND(9.0E-08U)	3.0E-07	ND(1.0E-06U)	ND(2.0E-07U)
1,2,3,7,8,9-HxCDD	ND(3.0E-07U)	ND(8.0E-07U)	ND(4.0E-07U)	ND(2.0E-07U)	ND(3.0E-07U)	ND(2.0E-07U)	ND(4.0E-07U)	ND(9.0E-08U)	ND(2.0E-07U)	ND(1.0E-06U)	ND(2.0E-07U)
1,2,3,4,6,7,8-HpCDD	ND(5.0E-07U)	ND(1.0E-06U)	ND(7.0E-07U)	2.9E-07	6.5E-07	ND(1.8E-07UJ)	ND(4.0E-07U)	1.5E-07	ND(2.3E-07UJ)	ND(1.8E-06U)	ND(2.0E-07U)
1,2,3,4,6,7,8,9-OCDD	ND(4.5E-07UJ)	ND(1.8E-06UJ)	ND(1.8E-06U)	6.7E-07	ND(1.8E-06UJ)	4.9E-07	ND(1.2E-06U)	ND(4.7E-07UJ)	1.1E-06	ND(6.7E-06U)	ND(5.0E-07U)
PCDF (mg/kg)											
2,3,7,8-TCDF	4.9E-07	1.5E-06	4.2E-06	4.4E-06	7.1E-06	3.7E-06	4.1E-06	6.0E-07	1.72E-05	1.75E-05	4.2E-06
1,2,3,7,8-PeCDF	ND(2.0E-07U)	ND(5.0E-07U)	ND(1.0E-07U)	ND(2.4E-07UJ)	4.9E-07	1.6E-07	ND(2.0E-07U)	ND(6.0E-08U)	ND(3.1E-07UJ)	ND(7.0E-07U)	ND(1.6E-07UJ)
2,3,4,7,8-PeCDF	3.5E-07	ND(5.0E-07U)	8.6E-07	6.6E-07	ND(1.2E-06UJ)	ND(4.3E-07UJ)	6.0E-07	1.2E-07	ND(6.5E-07UJ)	ND(6.0E-07U)	5.1E-07
1,2,3,4,7,8-HxCDF	ND(2.0E-07U)	ND(5.0E-07U)	ND(2.0E-07U)	ND(1.0E-07UJ)	ND(2.0E-07U)	ND(1.0E-07U)	ND(2.0E-07U)	ND(6.0E-08U)	ND(1.0E-07U)	ND(7.0E-07U)	ND(1.0E-07U)
1,2,3,6,7,8-HxCDF	ND(1.0E-07U)	ND(4.0E-07U)	ND(2.0E-07U)	8.0E-08	ND(2.0E-07U)	ND(9.0E-08U)	ND(2.0E-07U)	ND(4.0E-08U)	ND(9.0E-08U)	ND(5.0E-07U)	ND(8.0E-08U)
2,3,4,6,7,8-HxCDF	ND(2.0E-07U)	ND(4.0E-07U)	ND(2.0E-07U)	1.7E-07	ND(2.0E-07U)	1.5E-07	ND(2.5E-07UJ)	ND(1.4E-07UJ)	1.7E-07	ND(6.0E-07U)	ND(1.3E-07UJ)
1,2,3,7,8,9-HxCDF	ND(2.0E-07U)	ND(6.0E-07U)	ND(3.0E-07U)	ND(1.0E-07U)	ND(3.0E-07U)	ND(1.0E-07U)	4.3E-07	ND(6.0E-08U)	ND(1.0E-07U)	ND(8.0E-07U)	ND(1.0E-07U)
1,2,3,4,6,7,8-HpCDF	1.8E-07 J	ND(5.0E-07U)	ND(4.0E-07U)	7.0E-08	ND(3.0E-07U)	ND(2.0E-07U)	ND(3.0E-07U)	ND(6.0E-08UJ)	ND(2.0E-07U)	ND(8.0E-07U)	ND(1.0E-07U)
1,2,3,4,7,8,9-HpCDF	ND(6.0E-07U)	ND(9.0E-07U)	ND(7.0E-07U)	ND(2.0E-07U)	ND(6.0E-07U)	ND(3.0E-07U)	ND(4.0E-07U)	ND(9.0E-08U)	ND(3.0E-07U)	ND(1.5E-06U)	ND(2.0E-07U)
1,2,3,4,6,7,8,9-OCDF	ND(1.1E-06U)	ND(1.4E-06U)	ND(1.5E-06U)	ND(3.0E-07U)	ND(1.5E-06U)	ND(6.0E-07U)	ND(1.0E-06U)	ND(2.0E-07U)	ND(6.0E-07U)	ND(5.7E-06U)	ND(4.0E-07U)

See Notes Page 2.

TABLE 3-51

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF FISH FILLET PCDD/PCDF RESULTS

Carp Fillet Samples												
Location	ABSA 1	ABSA 2	ABSA 3	ABSA 4	ABSA 5	ABSA 6	ABSA 7	ABSA 8	ABSA 9	ABSA 10	ABSA 11	ABSA 12
Sample Number	K40431	K40009	K40036	K40095	K40361	K40258	K40286	K40321	K40123	K40154	K40188	P40406
Sample Date	11/09/93	8/24/93	8/26/93	9/01/93	10/14/93	10/11/93	10/12/93	10/13/93	9/16/93	9/21/93	10/06/93	11/08/93
PCDD (mg/kg)												
2,3,7,8-TCDD	ND(2.0E-07U)	7.7E-07	1.7E-06	1.3E-05	1.6E-05	2.6E-06	4.8E-06	1.5E-06	ND(4.7E-06UJ)	4.9E-06	2.5E-06	2.5E-06
1,2,3,7,8-PeCDD	ND(3.0E-07U)	1.0E-06	ND(9.3E-07UJ)	6.9E-06	1.5E-06	6.9E-07	9.6E-07	ND(3.6E-07UJ)	ND(2.2E-06U)	ND(2.8E-06UJ)	1.0E-06	ND(3.0E-07U)
1,2,3,4,7,8-HxCDD	ND(3.0E-07U)	8.1E-07	ND(4.0E-07U)	1.9E-06	ND(1.0E-06U)	4.5E-07	5.1E-07	8.4E-07	ND(2.2E-06U)	ND(1.7E-06U)	6.7E-07	ND(4.0E-07U)
1,2,3,6,7,8-HxCDD	ND(3.0E-07U)	2.6E-06	2.3E-06	1.15E-05	ND(7.4E-06UJ)	2.8E-06	3.2E-06	3.7E-06	2.1E-06	1.7E-06	2.8E-06	8.2E-07
1,2,3,7,8,9-HxCDD	ND(3.0E-07U)	ND(3.0E-07U)	ND(3.8E-07UJ)	2.0E-06	1.3E-06	ND(2.4E-07UJ)	5.3E-07	3.0E-07	ND(2.0E-06U)	ND(1.5E-06U)	5.5E-07	ND(3.0E-07U)
1,2,3,4,6,7,8-HpCDD	ND(5.0E-07U)	3.6E-06	3.2E-06	2.27E-05	2.99E-05	5.8E-06	1.27E-05	1.24E-05	5.4E-06	ND(2.7E-06UJ)	8.7E-06	4.1E-06
1,2,3,4,6,7,8,9-OCDD	1.4E-06	2.9E-06	ND(2.3E-06UJ)	1.44E-05	2.28E-05	3.6E-06	9.3E-06	8.7E-06	ND(3.1E-06UJ)	2.0E-06	4.6E-06	ND(2.6E-06UJ)
PCDF (mg/kg)												
2,3,7,8-TCDF	ND(1.9E-07UJ)	1.6E-06	2.2E-06	ND(8.9E-06UJ)	ND(1.33E-05UJ)	3.9E-07	ND(5.9E-06UJ)	9.6E-07	3.6E-06	4.6E-06	7.8E-06	ND(4.6E-07UJ)
1,2,3,7,8-PeCDF	ND(2.0E-07U)	ND(1.0E-07U)	5.0E-07	ND(1.4E-06UJ)	1.1E-06	9.0E-08	4.4E-07	1.5E-07	ND(1.1E-06U)	ND(1.0E-06U)	9.2E-07	ND(2.0E-07U)
2,3,4,7,8-PeCDF	ND(1.0E-07U)	ND(8.9E-07UJ)	3.7E-06	7.5E-06	4.6E-06	1.1E-06	2.1E-06	ND(5.0E-07UJ)	ND(2.0E-06UJ)	4.2E-06	2.6E-06	4.0E-07
1,2,3,4,7,8-HxCDF	ND(2.0E-07U)	3.9E-07	3.3E-07	3.0E-06	1.6E-06	1.8E-07	5.0E-07	4.2E-07	ND(1.3E-06U)	ND(1.0E-06U)	3.4E-07	ND(2.0E-07U)
1,2,3,6,7,8-HxCDF	ND(2.0E-07U)	ND(4.5E-07UJ)	4.6E-07	2.1E-06	1.2E-06	2.8E-07	3.6E-07	3.4E-07	ND(1.0E-06U)	ND(7.0E-07U)	4.1E-07	ND(2.0E-07U)
2,3,4,6,7,8-HxCDF	ND(2.0E-07U)	ND(2.8E-07UJ)	5.5E-07	1.5E-06	6.6E-07	2.7E-07	3.9E-07	2.6E-07	ND(1.2E-06U)	9.4E-07	4.4E-07	ND(2.0E-07U)
1,2,3,7,8,9-HxCDF	ND(3.0E-07U)	ND(3.0E-07U)	4.9E-07	1.1E-06	ND(7.0E-07U)	1.1E-07	1.6E-07	1.3E-07	ND(1.6E-06U)	ND(1.6E-06UJ)	3.7E-07	ND(2.0E-07U)
1,2,3,4,6,7,8-HpCDF	ND(3.0E-07U)	7.1E-07	ND(3.0E-07U)	2.4E-06	2.1E-06 J	3.4E-07 J	7.3E-07 J	7.4E-07	ND(1.4E-06U)	ND(1.0E-06U)	4.9E-07 J	2.8E-07
1,2,3,4,7,8,9-HpCDF	ND(5.0E-07U)	ND(5.0E-07U)	ND(6.0E-07U)	ND(1.0E-06U)	ND(9.0E-07U)	ND(2.0E-07U)	ND(2.0E-07U)	ND(1.0E-07U)	ND(2.6E-06U)	ND(1.8E-06U)	ND(2.0E-07U)	ND(4.0E-07U)
1,2,3,4,6,7,8,9-OCDF	ND(1.1E-06U)	ND(1.3E-06U)	ND(1.1E-06U)	ND(1.8E-06U)	ND(1.4E-06U)	ND(3.0E-07U)	ND(4.0E-07U)	ND(2.0E-07U)	ND(4.8E-06U)	ND(3.0E-06U)	ND(5.0E-07U)	ND(6.0E-07U)

Notes:

ND - Not detected.

J - The compound was positively identified; however, the associated numerical value is an estimated concentration only.

U - The compound was analyzed for but not detected. The associated value is the compound quantitation limit.

UJ - The compound was not detected above the reported sample quantitation limit. However, the reported limit is approximate and may or may not represent the actual limit of quantitation.

TABLE 3-52

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION

SUMMARY OF AQUATIC FIELD DATA AND CLP TCL/TAL ANALYSES RESULTS¹
ABSA 1 - TURTLES

Sample Number: Sample Date:	Snapping Turtle Samples										
	K42015 05/19/94	K42016 05/20/94	K42017 05/20/94	K42018 05/21/94	K42019 05/23/94	K42022 05/24/94	K42023 05/24/94	K42024 05/24/94	K42025 05/25/94	K42026 05/25/94	K42027 05/25/94
Field Data											
Sample Type	Whole Body	Whole Body	Muscle	Muscle	Whole Body	Muscle	Muscle	Whole Body	Muscle	Muscle	Whole Body
Gender	Male	Male	Female	Male	Male	Female	Male	Female	Female	Male	Male
Length (cm)	22	22	36	20	29	27	27	24	26	32	30
Weight (g)	2300	2600	11000	1800	5800	4100	4300	3800	4100	6700	6400
Laboratory Data											
% Lipids	5.68	3.62	0.18	0.10	0.05	0.34	0.15	1.70	0.17	0.08	1.10
PCB (mg/kg)											
Aroclor 1260	0.27	0.29	ND(0.050U)	0.024 J	0.15 J	8.1	0.038 J	0.26	0.021 J	0.044 J	0.49
Total PCB	0.27	0.29	ND	0.024 J	0.15 J	8.1	0.038 J	0.26	0.021 J	0.044 J	0.49

Notes:

¹ Showing only the results for compounds/analytes detected above the quantitation limit.

J - The compound/analyte was positively identified; however, the associated numerical value is an estimated concentration only.

U - The compound was analyzed for but not detected. The associated value is the compound quantitation limit.

ND - Not detected.

TABLE 3-53

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CLP TCL/TAL ANALYSES RESULTS¹
ABSA 5 - TURTLES

Sample Number: Sample Date:	Snapping Turtle Samples										
	K42001 08/27/93	K42002 08/27/93	K42003 08/30/93	K42004 08/30/93	K42005 08/31/93	K42006 09/03/93	K42007 09/14/93	K42008 09/21/93	K42009 09/21/93	K42010 09/23/93	K42030 05/26/94
Field Data											
Sample Type	Muscle	Whole Body	Muscle	Muscle	Whole Body	Whole Body	Muscle	Muscle	Muscle	Whole Body	Whole Body
Gender	Male	Male	Female	Male	Male	Male	Male	Female	Female	Female	Male
Length (cm)	36	29	27	28	29	29	39	32	29	29	21
Weight (g)	12000	4700	4800	3800	4600	6000	11000	8500	5300	5400	2200
Laboratory Data											
% Lipids	0.50	0.48	0.68	1.02	0.84	1.79	0.49	0.44	0.55	0.81	4.18
PCB (mg/kg)											
Aroclor 1260	1.9 D	0.42	0.35	1.3 D	0.53	1.5	0.36	0.36	0.23	1.2 D	0.27
Total PCB	1.9D	0.42	0.35	1.3D	0.53	1.5	0.36	0.36	0.23	1.2D	0.27

Notes:

¹ Showing only the results for compounds/analytes detected above the quantitation limit.

D - Concentration is based on a diluted sample analysis.

U - The compound was analyzed for but not detected. The associated value is the compound quantitation limit.

ND - Not detected.

TABLE 3-54

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF AQUATIC FIELD DATA AND CLP TCL/TAL ANALYSES RESULTS¹
ABSA 10 - TURTLES

Sample Number: Sample Date:	Snapping Turtle Samples										
	K42011 05/17/94	K42012 05/17/94	K42014 05/18/94	K42020 05/23/94	K42021 05/23/94	K42028 05/26/94	K42029 05/26/94	K42031 05/26/94	K42032 05/27/94	K42033 06/01/94	K42034 06/01/94
Field Data											
Sample Type	Muscle	Muscle	Whole Body	Whole Body	Whole Body	Muscle	Muscle	Whole Body	Whole Body	Muscle	Muscle
Gender	Female	Male	Female	Male	Male	Male	Female	Male	Male	Male	Female
Length (cm)	25	32	25	25	27	29	25	22	28	29	25
Weight (g)	3900	8400	4500	3400	4900	6700	4900	2700	6800	6200	3500
Laboratory Data											
% Lipids	0.04	0.04	5.5	0.58	4.9	0.10	0.10	1.25	1.25	0.17	0.07
PCB (mg/kg)											
Aroclor 1254	ND(0.050U)	ND(0.050U)	ND(1.2U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	ND(0.050U)	0.53	ND(0.050U)	ND(0.050U)	ND(0.050U)
Aroclor 1260	0.11	0.15	7.9	0.097	ND(0.050U)	0.24	ND(0.050U)	0.72	2.6	0.25	0.11
Total PCB	0.11	0.15	7.9	0.097	ND	0.24	ND	1.3	2.6	0.25	0.11

Notes:

¹ Showing only the results for compounds/analytes detected above the quantitation limit.

U - The compound was analyzed for but not detected. The associated value is the compound quantitation limit.

ND - Not detected.

TABLE 3-55

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF SNAPPING TURTLE FLESH PCDD/PCDF RESULTS¹

Location Sample Number	ABSA1 K42022	ABSA5 K42001	ABSA10 K42033
PCDD (mg/kg)			
2,3,7,8-TCDD	ND(7.0E-8UJ)	4.1E-06	7.8E-07 J
1,2,3,7,8-PeCDD	8.0E-08	1.6E-06	4.3E-07 J
1,2,3,6,7,8-HxCDD	1.3E-07	1.8E-06	6.9E-07 J
1,2,3,4,6,7,8-HpCDD	ND(8.6E-07U)	1.4E-06 B	ND(1.4E-06UJ)
PCDF (mg/kg)			
2,3,7,8-TCDF	1.5E-07	1.1E-07	2.0E-07 J
2,3,4,7,8-PeCDF	ND(7.0E-8UJ)	9.6E-07	8.7E-07 J
1,2,3,4,7,8-HxCDF	1.2E-07	ND(2.0E-7U)	ND(2.0E-7UJ)
1,2,3,6,7,8-HxCDF	4.0E-08 PRJ	ND(1.0E-7U)	ND(1.0E-7UJ)
1,2,3,4,6,7,8-HpCDF	2.6E-07	ND(2.0E-7U)	ND(2.0E-7UJ)
1,2,3,4,6,7,8,9-OCDF	9.4E-07	ND(5.0E-07U)	9.9E-07 J

Notes:

¹ - Showing only the results for congeners detected above quantitation limit.

ND - Not detected.

UJ - The compound was not detected above the reported sample quantitation limit; however, the limit is approximate and may or may not represent the actual limit of quantitation.

PR - The reported concentration may be underestimated due to a poorly resolved GC peak.

J - The compound was positively identified; however, the associated numerical value is an estimated concentration only.

U - The compound was analyzed for but not detected. The associated value is the compound quantitation limit.

B - The compound has been found in the sample as well as its associated blank; its presence in the sample may be suspect.

TABLE 3-56

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
TBSA PHASE II COMPOSITE SAMPLES PCB ANALYTICAL RESULTS (mg/kg)

Sample Number	BBL Sample ID	Depth (ft)	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total PCB
TBSA 1										
K12036	TBSA1-1	0.00-1.0	ND(0.076U)	ND(0.076U)	ND(0.076U)	ND(0.076U)	0.051 J	0.061J	0.034 J	0.15 J
K12037	TBSA1-2	0.00-1.0	ND(0.075U)	ND(0.075U)	ND(0.075U)	ND(0.075U)	ND(0.075U)	0.20	ND(0.075U)	0.200
K12038	TBSA1-3	0.00-1.0	ND(0.075UJ)	ND(0.075UJ)	ND(0.075UJ)	0.045 J	ND(0.075UJ)	0.093 J	0.033 J	0.17 J
K12039	TBSA1-4	0.00-1.0	ND(0.078U)	ND(0.078U)	ND(0.078U)	ND(0.078U)	ND(0.078U)	0.17	0.032 J	0.20 J
K12040	TBSA1-5	0.00-1.0	ND(0.073U)	ND(0.073U)	ND(0.073U)	ND(0.073U)	ND(0.073U)	0.065J	ND(0.073U)	0.065 J
K12041	TBSA1-5 (DUP)	0.00-1.0	ND(0.077U)	ND(0.077U)	ND(0.077U)	ND(0.077U)	ND(0.077U)	0.077	ND(0.077U)	0.077
TBSA 3										
K12029	TBSA3-1	0.00-1.0	ND(2.0U)	ND(2.0U)	ND(2.0U)	ND(2.0U)	17	3.8	ND(2.0U)	21
K12030	TBSA3-2	0.00-1.0	ND(2.9U)	ND(2.9U)	ND(2.9U)	ND(2.9U)	30	ND(2.9U)	2.6 J	33 J
K12031	TBSA3-3	0.00-1.0	ND(2.8U)	ND(2.8U)	ND(2.8U)	ND(2.8U)	21	5.8	ND(2.8U)	27
K12032	TBSA3-3 (DUP)	0.00-1.0	ND(2.8U)	ND(2.8U)	ND(2.8U)	ND(2.8U)	20	4.6	1.5 J	26 J
K12033	TBSA3-4	0.00-1.0	ND(1.9U)	ND(1.9U)	ND(1.9U)	ND(1.9U)	16	2.7	1.7 J	20 J
K12034	TBSA3-5	0.00-1.0	ND(2.8U)	ND(2.8U)	ND(2.8U)	ND(2.8U)	15	5.2	1.3 J	22 J
TBSA 5										
K12024	TBSA5-1	0.00-1.0	ND(1.8U)	ND(1.8U)	ND(1.8U)	ND(1.8U)	19	3.7	1.8 J	25 J
K12025	TBSA5-2	0.00-1.0	ND(2.7U)	ND(2.7U)	ND(2.7U)	ND(2.7U)	31	ND(2.7U)	3.5	35
K12026	TBSA5-3	0.00-1.0	ND(1.8U)	ND(1.8U)	ND(1.8U)	ND(1.8U)	21	1.8	2.2	25
K12027	TBSA5-4	0.00-1.0	ND(1.8U)	ND(1.8U)	ND(1.8U)	ND(1.8U)	20	2.5	1.7 J	24 J
K12028	TBSA5-5	0.00-1.0	ND(1.8U)	ND(1.8U)	ND(1.8U)	ND(1.8U)	25	ND(1.8U)	2.7	28
TBSA 10										
K12012	TBSA10-1	0.00-1.0	ND(0.36U)	ND(0.36U)	ND(0.36U)	ND(0.36U)	3.3	0.89	ND(0.36U)	4.2
K12013	TBSA10-2	0.00-1.0	ND(0.40U)	ND(0.40U)	ND(0.40U)	ND(0.40U)	3.8	1.9	ND(0.40U)	5.7
K12014	TBSA10-3	0.00-1.0	ND(0.38U)	ND(0.38U)	ND(0.38U)	ND(0.38U)	2.9	1.1	0.26 J	4.3 J
K12015	TBSA10-4	0.00-1.0	ND(0.87U)	ND(0.87U)	ND(0.87U)	ND(0.87U)	8.7	1.5	ND(0.87U)	10
K12016	TBSA10-5	0.00-1.0	ND(0.51U)	ND(0.51U)	ND(0.51U)	ND(0.51U)	6.4	1.1	0.70	8.2
TBSA 11										
K12017	TBSA11-1	0.00-1.0	ND(0.15U)	ND(0.15U)	ND(0.15U)	ND(0.15U)	0.22	0.061 J	ND(0.15U)	0.28 J
K12018	TBSA11-2	0.00-1.0	ND(0.14U)	ND(0.14U)	ND(0.14U)	ND(0.14U)	ND(0.14U)	ND(0.14U)	ND(0.14U)	ND
K12019	TBSA11-3	0.00-1.0	ND(0.12UJ)	ND(0.12UJ)	ND(0.12UJ)	ND(0.12UJ)	0.39 J	ND(0.12UJ)	ND(0.12UJ)	0.39 J
K12020	TBSA11-4	0.00-1.0	ND(0.11U)	ND(0.11U)	ND(0.11U)	ND(0.11U)	ND(0.11U)	ND(0.11U)	ND(0.11U)	ND
K12021	TBSA11-5	0.00-1.0	ND(0.11U)	ND(0.11U)	ND(0.11U)	ND(0.11U)	ND(0.11U)	ND(0.11U)	ND(0.11U)	ND
K12022-RE	TBSA11-5 (DUP)	0.00-1.0	ND(0.10UJ)	ND(0.10UJ)	ND(0.10UJ)	ND(0.10UJ)	ND(0.10UJ)	ND(0.10UJ)	ND(0.10UJ)	ND

Notes:

J - The compound was positively identified; however, the associated numerical value is an estimated concentration only.

U - The compound was analyzed for but not detected. The associated value is the compound quantitation limit.

ND - Not detected.

DUP - Duplicate sample.

TABLE 3-57

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF TERRESTRIAL BIOTA ANALYTICAL RESULTS
MICE

Sample Number: Sample Date:	White-footed Mice Whole Body Samples									
	TBSA 1									
	K44000	K44001	K44002	K44003	K44004	K44005	K44006	K44007	K44008	K44009
	9/29/93	9/29/93	9/29/93	9/29/93	9/29/93	9/29/93	9/29/93	9/29/93	9/30/93	9/30/93
Laboratory Data										
% Lipids	3.9	1.7	2.8	3.8	1.8	3.6	2.0	1.2	1.9	1.0
PCB (mg/kg)										
Aroclor 1260	0.064	0.027 J	0.35	0.011 J	ND(0.059U)	ND(0.048U)	0.029 J	0.020 J	0.077	0.042 J
Total PCB	0.064	0.027 J	0.35	0.011 J	ND	ND	0.029 J	0.020 J	0.077	0.042 J
Mean Total PCB ¹	0.067									

Sample Number: Sample Date:	White-footed Mice Whole Body Samples									
	TBSA 3									
	K44010	K44011	K44012	K44013	K44014	K44015	K44016	K44017	K44018	K44019
	10/5/93	10/5/93	10/6/93	10/6/93	10/7/93	10/7/93	10/8/93	10/8/93	10/9/93	10/9/93
Laboratory Data										
% Lipids	1.8	0.8	1.7	1.0	1.0	0.5	1.2	1.2	3.2	2.3
PCB (mg/kg)										
Aroclor 1260	0.17	0.076	ND(0.090U)	0.45	ND(0.066U)	0.063	0.15	0.017 J	0.13	0.10
Total PCB	0.17	0.076	ND	0.45	ND	0.063	0.15	0.017 J	0.13	0.10
Mean Total PCB ¹	0.12									

See notes on page 3.

TABLE 3-57

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF TERRESTRIAL BIOTA ANALYTICAL RESULTS
MICE

	White-footed Mice Whole Body Samples									
	TBSA 5									
	K44020	K44021	K44022	K44023	K44024	K44025	K44026	K44027	K44028	K44029
Sample Number:	10/8/93	10/8/93	10/8/93	10/8/93	10/9/93	10/9/93	10/9/93	10/9/93	10/9/93	10/9/93
Sample Date:										
Laboratory Data										
% Lipids	1.2	1.4	1.4	1.2	0.9	1.1	1.1	0.7	0.8	0.8
PCB (mg/kg)										
Aroclor 1260	0.30	0.35	0.29	0.27	0.34	0.23	0.13	0.22	0.089	0.38
Total PCB	0.30	0.35	0.29	0.27	0.34	0.23	0.13	0.22	0.089	0.38
Mean Total PCB	0.26									

	White-footed Mice Whole Body Samples									
	TBSA 10									
	K44040	K44041	K44042	K44043	K44044	K44045	K44046	K44047	K44048	K44049
Sample Number:	10/21/93	10/21/93	10/21/93	10/21/93	10/21/93	10/21/93	10/21/93	10/21/93	10/22/93	10/22/93
Sample Date:										
Laboratory Data										
% Lipids	0.6	1.4	0.8	0.9	0.8	0.8	2.5	0.9	1.8	0.6
PCB (mg/kg)										
Aroclor 1260	ND(0.058U)	0.12	ND(0.065U)	0.073	0.057	0.11	0.28	0.13	0.060	ND(0.064U)
Total PCB	ND	0.12	ND	0.073	0.057	0.11	0.28	0.13	0.060	ND
Mean Total PCB ¹	0.92									

See notes on page 3.

TABLE 3-57

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF TERRESTRIAL BIOTA ANALYTICAL RESULTS
MICE

Sample Number: Sample Date:	White-footed Mice Whole Body Samples									
	TBSA 11									
	K44030	K44031	K44032	K44033	K44034	K44035	K44036	K44037	K44038	K44039
	10/21/93	10/21/93	10/22/93	10/22/93	10/22/93	10/22/93	10/24/93	10/24/93	10/24/93	10/24/93
Laboratory Data										
% Lipids	0.6	3.2	0.6	1.8	0.4	1.6	0.7	1.2	1.2	1.5
PCB (mg/kg)										
Aroclor 1260	ND(0.050U)	ND(0.078U)	ND(0.055U)	ND(0.076U)	ND(0.066U)	ND(0.060U)	ND(0.076U)	ND(0.11U)	ND(0.11U)	ND(0.098U)
Total PCB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mean Total PCB	ND									

Notes:

¹ In the case of non-detections, one-half the detection limit was used for averaging purposes.

J - The compound was positively identified; however, the associated numerical value is an estimated concentration only.

U - The compound was analyzed for but not detected. The associated value is the compound quantitation limit.

ND - Not detected.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF TERRESTRIAL BIOTA ANALYTICAL RESULTS¹
EARTHWORMS

Sample Number: Sample Date:	Earthworm Composite Samples								
	K46000 10/05/93	K46001 10/05/93	K46002 10/05/93	K46003 10/10/93	K46004 10/10/93	K46005 10/10/93	K46006 10/10/93	K46007 10/22/93	K46008 10/22/93
	TBSA 1			TBSA 3			TBSA 5		
Laboratory Data									
% Lipids	1.28	1.27	1.34	1.75	1.95	1.77	2.28	1.61	1.98
PCB (mg/kg)									
Aroclor 1248	ND(0.050UJ)	ND(0.050U)	ND(0.050U)	2.5	1.4	2.0	0.92 J	1.8	1.5
Aroclor 1254	ND(0.050UJ)	ND(0.050U)	ND(0.050U)	ND(0.25U)	0.73	1.2	0.39 J	0.41	0.69
Aroclor 1260	0.023 J	0.024 J	0.025 J	ND(0.25U)	ND(0.10U)	ND(0.25U)	ND(0.075UJ)	ND(0.13U)	ND(0.10U)
Total PCB	0.023 J	0.024 J	0.025 J	2.5	2.1	3.2	1.3 J	2.2	2.2
Mean Total PCB	0.024			2.6			1.9		

Sample Number: Sample Date:	Earthworm Composite Samples					
	K46012 10/05/93	K46013 10/05/93	K46014 10/05/93	K46009 10/10/93	K46010 RE 10/10/93	K46011 10/10/93
	TBSA 10			TBSA 11		
Laboratory Data						
% Lipids	1.75	1.96	2.50	1.31	NA	1.87
PCB (mg/kg)						
Aroclor 1248	0.41	0.24	ND(0.050UJ)	ND(0.050U)	ND(0.059U)	ND(0.050U)
Aroclor 1254	0.25	0.35	0.13 J	ND(0.050U)	ND(0.059U)	ND(0.050U)
Aroclor 1260	ND(0.050U)	ND(0.050U)	ND(0.050UJ)	ND(0.050U)	ND(0.059U)	ND(0.050U)
Total PCB	0.66	0.59	0.13 J	ND	ND	ND
Mean Total PCB	0.46			ND		

Notes:

¹ Showing only the results for compounds detected above the quantification limit.

U - The compound was analyzed but not detected. The associated numerical value is the quantitation limit.

J - The compound was positively identified; however, the associated numerical value is an estimated concentration only.

ND - Not detected.

NA - Data not available due to a laboratory accident.

Table 4-1

Allied Paper, Inc./Portage Creek/Kalamazoo River
Superfund Site

Fish Investigation
Comparison of 1993 and 1997 Fish PCB Data

ABSA	Fish	Averages					
		PCB (mg/kg wet-weight)		Percent Lipids		Lipid-Adjusted PCB (PCB mg/kg lipid)	
		1993	1997	1993	1997	1993	1997
1 Battle Creek/Ceresco Reservoir	Carp Fillet ¹	0.083	0.088	1.2	0.75	8.7	11
	Smallmouth Bass Fillet ²	0.14	0.047*	1.4	0.50	9.1	11
2 Morrow Lake	Carp Fillet	0.61	0.26*	1.1	0.44	64	54
	Smallmouth Bass Fillet	0.28	0.11*	0.86	0.47	35	25
5 Plainwell Dam	Carp Fillet	5.8	6.0	5.3	5.7	120	120
	Smallmouth Bass Fillet	1.8	0.46*	1.2	0.26	160	170
9 Lake Allegan	Carp Fillet	1.8	0.73	1.4	0.68	130	140
	Smallmouth Bass Fillet	3.3	0.49*	2.9	0.49	120	120
11 Near Saugatuck	Carp Fillet	5.0	4.1	8.1	5.2	100	89
	Smallmouth Bass Fillet	0.54	1.1	0.87	0.52	64	230*

Notes:

¹ Carp fillets are prepared with skin-off.

² Smallmouth bass fillets are prepared with skin-on.

* Statistically different than 1993 PCB data ($p \leq 0.05$) based on t-tests of log-transformed data.

Table 4-2
Allied Paper, Inc./Portage Creek/Kalamazoo River
Superfund Site

1997 Fish Investigation
Coefficients of Determination (r^2) for Regressions of Wet-Weight PCB Concentrations Versus Other Parameters

Location	r^2 Values				
	ABSA 1	ABSA 2	ABSA 5	ABSA 9	ABSA 11
Carp Fillet Samples					
Length	0.017	0.0011	0.84 *	0.0062	0.21
Weight	0.096	0.012	0.95 *	0.22	0.19
Lipid	0.70*	0.93*	0.93 *	0.22	0.31
Smallmouth Bass Fillet Samples					
Length	0.063	6.3E-05	0.35	0.013	0.091
Weight	0.14	0.011	0.69 *	0.00022	0.10
Lipid	0.26	0.032	0.80 *	0.51 *	0.0023

Note: * = Statistically significant ($p \leq 0.05$)

TABLE 4-3

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION

COEFFICIENTS OF DETERMINATION (R^2) FOR REGRESSIONS OF WET WEIGHT PCB CONCENTRATIONS VERSUS OTHER
PARAMETERS AND COEFFICIENTS OF VARIATION FOR WET WEIGHT AND LIPID-ADJUSTED PCB CONCENTRATIONS
SNAPPING TURTLES

Location	R^2 Values					
	Whole Body Samples			Muscle Samples		
	ABSA 1	ABSA 5	ABSA 10	ABSA 1	ABSA 5	ABSA 10
Length	0.077	0.29	0.00070	0.0079	0.043	0.40
Weight	0.085	0.67	0.039	0.036	0.12	0.25
Lipid	0.00050	0.080	0.29	0.82	0.025	0.25
Location	Coefficient of Variation					
	Whole Body Samples			Muscle Samples		
	ABSA 1	ABSA 5	ABSA 10	ABSA 1	ABSA 5	ABSA 10
Wet Weight PCB	42	68	140	240	81	58
PCB/Lipid	170	66	91	230	100	59

TABLE 4-4

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITEBIOTA INVESTIGATION
SUMMARY OF DETECTED PCDD/PCDF IN SMALLMOUTH BASS FILLETS
AND LIPID-ADJUSTED TCDD-EQUIVALENT CONCENTRATIONS

Compound	TCDD Toxicity Equivalency Factor ¹	ABSA 1 K40241		ABSA 2 K40026		ABSA 3 K40045		ABSA 4 K40113		ABSA 5 K40353		ABSA 6 K40253	
		Sample Concentration (mg/kg)	TCDD Equivalent Concentration ² (mg/kg)	Sample Concentration (mg/kg)	TCDD Equivalent Concentration ² (mg/kg)	Sample Concentration (mg/kg)	TCDD Equivalent Concentration ² (mg/kg)	Sample Concentration (mg/kg)	TCDD Equivalent Concentration ² (mg/kg)	Sample Concentration (mg/kg)	TCDD Equivalent Concentration ² (mg/kg)	Sample Concentration (mg/kg)	TCDD Equivalent Concentration ² (mg/kg)
2,3,7,8-TCDD	1	ND	0.0E+00	ND	0.0E+00	5.7E-07	5.7E-07	7.8E-07	7.8E-07	4.7E-06	4.7E-06	9.1E-07	9.1E-07
1,2,3,7,8-PeCDD	0.5	4.3E-07 J	2.2E-07	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	4.4E-07	2.2E-07	1.9E-07	9.5E-08
1,2,3,4,7,8-HxCDD	0.1	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00
1,2,3,6,7,8-HxCDD	0.1	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	2.2E-07	2.2E-08	5.5E-07	5.5E-08	1.9E-07	1.9E-08
1,2,3,7,8,9-HxCDD	0.1	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00
1,2,3,4,6,7,8-HpCDD	0.01	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	2.9E-07	2.9E-09	6.5E-07	6.5E-09	ND	0.0E+00
1,2,3,4,6,7,8,9-OCDD	0.001	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	6.7E-07	6.7E-10	ND	0.0E+00	4.9E-07	4.9E-10
2,3,7,8-TCDF	0.1	4.9E-07	4.9E-08	1.5E-06	1.5E-07	4.2E-06	4.2E-07	4.4E-06	4.4E-07	7.1E-06	7.1E-07	3.7E-06	3.7E-07
1,2,3,7,8-PeCDF	0.05	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	4.9E-07	2.5E-08	1.6E-07	8.0E-09
2,3,4,7,8-PeCDF	0.5	3.5E-07	1.8E-07	ND	0.0E+00	8.6E-07	4.3E-07	6.6E-07	3.3E-07	ND	0.0E+00	ND	0.0E+00
1,2,3,4,7,8-HxCDF	0.1	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00
1,2,3,6,7,8-HxCDF	0.1	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	8.0E-08	8.0E-09	ND	0.0E+00	ND	0.0E+00
2,3,4,6,7,8-HxCDF	0.1	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	1.7E-07	1.7E-08	ND	0.0E+00	1.5E-07	1.5E-08
1,2,3,7,8,9-HxCDF	0.1	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00
1,2,3,4,6,7,8-HpCDF	0.01	1.8E-07 J	0.0E+00	ND	0.0E+00	ND	0.0E+00	7.0E-08	7.0E-10	ND	0.0E+00	ND	0.0E+00
1,2,3,4,7,8,9-HpCDF	0.01	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00
1,2,3,4,6,7,8,9-OCDF	0.001	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00
Total TCDD - Equivalent Concentration			4.5E-07	1.5E-07		1.4E-06		1.6E-06		5.7E-06		1.4E-06	
Percent Lipid Concentration			2.3	1.9		2.6		1.1		1.6		1.4	
Lipid-Adjusted TEQ Concentration			2.0E-05	7.9E-06		5.5E-05		1.5E-04		3.6E-04		1.0E-04	

See Notes Page 2.

TABLE 4-4

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITEBIOTA INVESTIGATION
SUMMARY OF DETECTED PCDD/PCDF IN SMALLMOUTH BASS FILLETS
AND LIPID-ADJUSTED TCDD-EQUIVALENT CONCENTRATIONS

Compound	TCDD Toxicity Equivalency Factor ¹	ABSA 7 K40280		ABSA 8 K40305		ABSA 9 K40135		ABSA 10 K40164		ABSA 11 K40190	
		Sample Concentration (mg/kg)	TCDD Equivalent Concentration ² (mg/kg)	Sample Concentration (mg/kg)	TCDD Equivalent Concentration ² (mg/kg)	Sample Concentration (mg/kg)	TCDD Equivalent Concentration ² (mg/kg)	Sample Concentration (mg/kg)	TCDD Equivalent Concentration ² (mg/kg)	Sample Concentration (mg/kg)	TCDD Equivalent Concentration ² (mg/kg)
2,3,7,8-TCDD	1	4.0E-06	4.0E-06	3.6E-07	3.6E-07	1.3E-06	1.3E-06	ND	0.0E+00	4.9E-07	4.9E-07
1,2,3,7,8-PeCDD	0.5	3.4E-07	1.7E-07	ND	0.0E+00	2.3E-07	1.2E-07	ND	0.0E+00	2.2E-07	1.1E-07
1,2,3,4,7,8-HxCDD	0.1	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00
1,2,3,6,7,8-HxCDD	0.1	3.4E-07	3.4E-08	ND	0.0E+00	3.0E-07	3.0E-08	ND	0.0E+00	ND	0.0E+00
1,2,3,7,8,9-HxCDD	0.1	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00
1,2,3,4,6,7,8-HpCDD	0.01	ND	0.0E+00	1.5E-07	1.5E-09	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00
1,2,3,4,6,7,8,9-OCDD	0.001	ND	0.0E+00	ND	0.0E+00	1.1E-06	1.1E-09	ND	0.0E+00	ND	0.0E+00
2,3,7,8-TCDF	0.1	4.1E-06	4.1E-07	6.0E-07	6.0E-08	1.72E-05	1.7E-06	1.75E-05	1.8E-06	4.2E-06	4.2E-07
1,2,3,7,8-PeCDF	0.05	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00
2,3,4,7,8-PeCDF	0.5	6.0E-07	3.0E-07	1.2E-07	6.0E-08	ND	0.0E+00	ND	0.0E+00	5.1E-07	2.6E-07
1,2,3,4,7,8-HxCDF	0.1	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00
1,2,3,6,7,8-HxCDF	0.1	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00
2,3,4,6,7,8-HxCDF	0.1	ND	0.0E+00	ND	0.0E+00	1.7E-07	1.7E-08	ND	0.0E+00	ND	0.0E+00
1,2,3,7,8,9-HxCDF	0.1	4.3E-07	4.3E-08	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00
1,2,3,4,6,7,8-HpCDF	0.01	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00
1,2,3,4,7,8,9-HpCDF	0.01	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00
1,2,3,4,6,7,8,9-OCDF	0.001	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00
Total TCDD - Equivalent Concentration			5.0E-06		4.8E-07		3.2E-06		1.8E-06		1.3E-06
Percent Lipid Concentration			1.9		1.6		4.3		1.9		0.92
Lipid-Adjusted TEQ Concentration			2.6E-04		3.0E-05		7.4E-05		9.2E-05		1.4E-04

Notes:¹ - From USEPA, 1989.² - Concentrations are the sample concentration multiplied by the appropriate TCDD toxicity equivalency factor.

J - The compound was positively identified; however, the associated numerical value is an estimated concentration only.

ND - Not detected.

TABLE 4-5

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITEBIOTA INVESTIGATION
SUMMARY OF DETECTED PCDD/PCDF IN CARP FILLETS
AND LIPID-ADJUSTED TCDD-EQUIVALENT CONCENTRATIONS

Compound	TCDD Toxicity Equivalency Factor ¹	ABSA 1 K40431		ABSA 2 K40009		ABSA 3 K40036		ABSA 4 K40095		ABSA 5 K40361		ABSA 6 K40258	
		Sample Concentration (mg/kg)	TCDD Equivalent Concentration ² (mg/kg)	Sample Concentration (mg/kg)	TCDD Equivalent Concentration ² (mg/kg)	Sample Concentration (mg/kg)	TCDD Equivalent Concentration ² (mg/kg)	Sample Concentration (mg/kg)	TCDD Equivalent Concentration ² (mg/kg)	Sample Concentration (mg/kg)	TCDD Equivalent Concentration ² (mg/kg)	Sample Concentration (mg/kg)	TCDD Equivalent Concentration ² (mg/kg)
2,3,7,8-TCDD	1	ND	0.0E+00	7.7E-07	7.7E-07	1.7E-06	1.7E-06	1.3E-05	1.3E-05	1.6E-05	1.6E-05	2.6E-06	2.6E-06
1,2,3,7,8-PeCDD	0.5	ND	0.0E+00	1.0E-06	5.0E-07	ND	0.0E+00	6.9E-06	3.5E-06	1.5E-06	7.5E-07	6.9E-07	3.5E-07
1,2,3,4,7,8-HxCDD	0.1	ND	0.0E+00	8.1E-07	8.1E-08	ND	0.0E+00	1.9E-06	1.9E-07	ND	0.0E+00	4.5E-07	4.5E-08
1,2,3,6,7,8-HxCDD	0.1	ND	0.0E+00	2.6E-06	2.6E-07	2.3E-06	2.3E-07	1.15E-05	1.2E-06	ND	0.0E+00	2.8E-06	2.8E-07
1,2,3,7,8,9-HxCDD	0.1	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	2.0E-06	2.0E-07	1.3E-06	1.3E-07	ND	0.0E+00
1,2,3,4,6,7,8-HpCDD	0.01	ND	0.0E+00	3.6E-06	3.6E-08	3.2E-06	3.2E-08	2.27E-05	2.3E-07	2.99E-05	3.0E-07	5.8E-06	5.8E-08
1,2,3,4,6,7,8,9-OCDD	0.001	1.4E-06	1.4E-09	2.9E-06	2.9E-09	ND	0.0E+00	1.44E-05	1.4E-08	2.28E-05	2.3E-08	3.6E-06	3.6E-09
2,3,7,8-TCDF	0.1	ND	0.0E+00	1.6E-06	1.6E-07	2.2E-06	2.2E-07	ND	0.0E+00	ND	0.0E+00	3.9E-07	3.9E-08
1,2,3,7,8-PeCDF	0.05	ND	0.0E+00	ND	0.0E+00	5.0E-07	2.5E-08	ND	0.0E+00	1.1E-06	5.5E-08	9.0E-08	4.5E-09
2,3,4,7,8-PeCDF	0.5	ND	0.0E+00	ND	0.0E+00	3.7E-06	1.9E-06	7.5E-06	3.8E-06	4.6E-06	2.3E-06	1.1E-06	5.5E-07
1,2,3,4,7,8-HxCDF	0.1	ND	0.0E+00	3.9E-07	3.9E-08	3.3E-07	3.3E-08	3.0E-06	3.0E-07	1.6E-06	1.6E-07	1.8E-07	1.8E-08
1,2,3,6,7,8-HxCDF	0.1	ND	0.0E+00	ND	0.0E+00	4.6E-07	4.6E-08	2.1E-06	2.1E-07	1.2E-06	1.2E-07	2.8E-07	2.8E-08
2,3,4,6,7,8-HxCDF	0.1	ND	0.0E+00	ND	0.0E+00	5.5E-07	5.5E-08	1.5E-06	1.5E-07	6.6E-07	6.6E-08	2.7E-07	2.7E-08
1,2,3,7,8,9-HxCDF	0.1	ND	0.0E+00	ND	0.0E+00	4.9E-07	4.9E-08	1.1E-06	1.1E-07	ND	0.0E+00	1.1E-07	1.1E-08
1,2,3,4,6,7,8-HpCDF	0.01	ND	0.0E+00	7.1E-07	7.1E-09	ND	0.0E+00	2.4E-06	2.4E-08	2.1E-06 J	2.1E-08	3.4E-07	3.4E-09
1,2,3,4,7,8,9-HpCDF	0.01	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00
1,2,3,4,6,7,8,9-OCDF	0.001	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00
Total TCDD - Equivalent Concentration			1.4E-09		1.9E-06		4.3E-06		2.3E-05		2.0E-05		4.0E-06
Percent Lipid Concentration			1.4		4.2		3.3		14		12		2.5
Lipid-Adjusted TEQ Concentration			1.0E-07		4.5E-05		1.3E-04		1.6E-04		1.7E-04		1.6E-04

See Notes Page 2.

TABLE 4-5

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITEBIOTA INVESTIGATION
SUMMARY OF DETECTED PCDD/PCDF IN CARP FILLETS
AND LIPID-ADJUSTED TCDD-EQUIVALENT CONCENTRATIONS

Compound	TCDD Toxicity Equivalency Factor ¹	ABSA 7 K40286		ABSA 8 K40321		ABSA 9 K40123		ABSA 10 K40154		ABSA 11 K40188		ABSA 12 P40406	
		Sample Concentration (mg/kg)	TCDD Equivalent Concentration ² (mg/kg)	Sample Concentration (mg/kg)	TCDD Equivalent Concentration ² (mg/kg)	Sample Concentration (mg/kg)	TCDD Equivalent Concentration ² (mg/kg)	Sample Concentration (mg/kg)	TCDD Equivalent Concentration ² (mg/kg)	Sample Concentration (mg/kg)	TCDD Equivalent Concentration ² (mg/kg)	Sample Concentration (mg/kg)	TCDD Equivalent Concentration ² (mg/kg)
2,3,7,8-TCDD	1	4.8E-06	4.8E-06	1.5E-06	1.5E-06	ND	0.0E+00	4.9E-06	4.9E-06	2.5E-06	2.5E-06	2.5E-06	2.5E-06
1,2,3,7,8-PeCDD	0.5	9.6E-07	4.8E-07	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	1.0E-06	5.0E-07	ND	0.0E+00
1,2,3,4,7,8-HxCDD	0.1	5.1E-07	5.1E-08	8.4E-07	8.4E-08	ND	0.0E+00	ND	0.0E+00	6.7E-07	6.7E-08	ND	0.0E+00
1,2,3,6,7,8-HxCDD	0.1	3.2E-06	3.2E-07	3.7E-06	3.7E-07	2.1E-06	2.1E-07	1.7E-06	1.7E-07	2.8E-06	2.8E-07	8.2E-07	8.2E-08
1,2,3,7,8,9-HxCDD	0.1	5.3E-07	5.3E-08	3.0E-07	3.0E-08	ND	0.0E+00	ND	0.0E+00	5.5E-07	5.5E-08	ND	0.0E+00
1,2,3,4,6,7,8-HpCDD	0.01	1.27E-05	1.3E-07	1.24E-05	1.2E-07	5.4E-06	5.4E-08	ND	0.0E+00	8.7E-06	8.7E-08	4.1E-06	4.1E-08
1,2,3,4,6,7,8,9-OCDD	0.001	9.3E-06	9.3E-09	8.7E-06	8.7E-09	ND	0.0E+00	2.0E-06	2.0E-09	4.6E-06	4.6E-09	ND	0.0E+00
2,3,7,8-TCDF	0.1	ND	0.0E+00	9.6E-07	9.6E-08	3.6E-06	3.6E-07	4.6E-06	4.6E-07	7.8E-06	7.8E-07	ND	0.0E+00
1,2,3,7,8-PeCDF	0.05	4.4E-07	2.2E-08	1.5E-07	7.5E-09	ND	0.0E+00	ND	0.0E+00	9.2E-07	4.6E-08	ND	0.0E+00
2,3,4,7,8-PeCDF	0.5	2.1E-06	1.1E-06	ND	0.0E+00	ND	0.0E+00	4.2E-06	2.1E-06	2.6E-06	1.3E-06	4.0E-07	2.0E-07
1,2,3,4,7,8-HxCDF	0.1	5.0E-07	5.0E-08	4.2E-07	4.2E-08	ND	0.0E+00	ND	0.0E+00	3.4E-07	3.4E-08	ND	0.0E+00
1,2,3,6,7,8-HxCDF	0.1	3.6E-07	3.6E-08	3.4E-07	3.4E-08	ND	0.0E+00	ND	0.0E+00	4.1E-07	4.1E-08	ND	0.0E+00
2,3,4,6,7,8-HxCDF	0.1	3.9E-07	3.9E-08	2.6E-07	2.6E-08	ND	0.0E+00	9.4E-07	9.4E-08	4.4E-07	4.4E-08	ND	0.0E+00
1,2,3,7,8,9-HxCDF	0.1	1.6E-07	1.6E-08	1.3E-07	1.3E-08	ND	0.0E+00	ND	0.0E+00	3.7E-07	3.7E-08	ND	0.0E+00
1,2,3,4,6,7,8-HpCDF	0.01	7.3E-07 J	7.3E-09	7.4E-07	7.4E-09	ND	0.0E+00	ND	0.0E+00	4.9E-07	4.9E-09	2.8E-07	2.8E-09
1,2,3,4,7,8,9-HpCDF	0.01	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00
1,2,3,4,6,7,8,9-OCDF	0.001	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00
Total TCDD - Equivalent Concentration			7.1E-06		2.3E-06		6.2E-07		7.7E-06		5.8E-06		2.8E-06
Percent Lipid Concentration			6.8		5.7		2.8		2.9		7.5		1.4
Lipid-Adjusted TEQ Concentration			1.0E-04		4.0E-05		2.2E-05		2.7E-04		7.7E-05		2.0E-04

Notes:¹ - From USEPA, 1989.² - Concentrations are the sample concentration multiplied by the appropriate TCDD toxicity equivalency factor.

ND - Not detected.

TABLE 4-6

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITE

BIOTA INVESTIGATION
SUMMARY OF PCDD/PCDF RESULTS AND TOTAL TCDD-EQUIVALENT CONCENTRATIONS
IN TURTLE MUSCLE SAMPLES

Compound	TCDD Toxicity Equivalent Factor ¹	ABSA 1 K42022		ABSA 5 K42001		ABSA 10 K42033	
		Sample Concentration (mg/kg)	TCDD Equivalent Concentration ² (mg/kg)	Sample Concentration (mg/kg)	TCDD Equivalent Concentration ² (mg/kg)	Sample Concentration (mg/kg)	TCDD Equivalent Concentration ² (mg/kg)
2,3,7,8-TCDD	1	ND(0.070UJ)	0.0E+00	4.1E-06	4.1E-06	7.8E-07	7.8E-07
1,2,3,7,8-PeCDD	0.5	8.0E-08	4.0E-08	1.6E-06	8.0E-07	4.3E-07	2.2E-07
1,2,3,4,7,8-HxCDD	0.1	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00
1,2,3,6,7,8-HxCDD	0.1	1.3E-07	1.3E-08	1.8E-06	1.8E-07	6.9E-07	6.9E-08
1,2,3,7,8,9-HxCDD	0.1	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00
1,2,3,4,6,7,8-HpCDD	0.01	ND	0.0E+00	1.4E-06	1.4E-08	ND	0.0E+00
1,2,3,4,6,7,8,9-OCDD	0.001	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00
2,3,7,8-TCDF	0.1	1.5E-07	1.5E-08	1.1E-07	1.1E-08	2.0E-07	2.0E-08
1,2,3,7,8-PeCDF	0.05	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00
2,3,4,7,8-PeCDF	0.5	ND	0.0E+00	9.6E-07	4.8E-07	8.7E-07	4.4E-07
1,2,3,4,7,8-HxCDF	0.1	1.2E-07	1.2E-08	ND	0.0E+00	ND	0.0E+00
1,2,3,6,7,8-HxCDF	0.1	4.0E-08 PRJ	4.0E-09	ND	0.0E+00	ND	0.0E+00
2,3,4,6,7,8-HxCDF	0.1	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00
1,2,3,7,8,9-HxCDF	0.1	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00
1,2,3,4,6,7,8-HpCDF	0.01	2.6E-07	2.6E-09	ND	0.0E+00	ND	0.0E+00
1,2,3,4,7,8,9-HpCDF	0.01	ND	0.0E+00	ND	0.0E+00	ND	0.0E+00
1,2,3,4,6,7,8,9-OCDF	0.001	9.4E-07	9.4E-10	ND	0.0E+00	9.9E-07	9.9E-10
Total TCDD - Equivalent Concentration			8.8E-08		5.6E-06		1.5E-06

Notes:¹ - From USEPA, 1989.² - Concentrations are the sample concentration multiplied by the appropriate TCDD toxicity equivalency factor.

B - The compound has been found in the sample as well as its associated blank; its presence in the sample may be suspect.

J - The compound was positively identified; however, the associated numerical value is an estimated concentration only.

U - The compound was analyzed for but not detected. The associated value is the compound quantitation limit.

UJ - The compound was not detected above the reported sample quantitation limit. However, the reported limit is approximate and may or may not represent the actual limit of quantitation.

ND - Not detected.

PR - The reported concentration may be underestimated due to a poorly resolved GC peak.

APPENDIX A

*Estimating Whole-Body Fish PCB Concentrations
From Measurements of PCB in Fillets -
Results of the Pilot Study*

APPENDIX A

Estimating Whole-Body Fish PCB Concentrations

From Measurements of PCB in Fillets

Results of the Pilot Study

1. Introduction

Two types of fish PCB concentration data are desirable for risk assessment (RA) purposes: concentrations in edible portions (i.e. fillets) to be used for human exposure estimation and risk assessment, and whole-body concentrations to be used in ecological risk assessment calculations. To maximize efficiency in generating these two types of data, a pilot study was performed with Kalamazoo River fish to determine if whole-body PCB concentrations could be predicted reliably on the basis of measured PCB levels in fillets, and measured lipid levels in fillets and remaining-carcass samples. If a reliable relationship can be demonstrated, it obviates the need to sample additional specimens for whole-body PCB analysis, or to analyze additional remaining-carcass samples for PCB.

Data for Great Lakes and river fish provided by MDNR and available in the literature were used initially to assess the viability of the recommended procedure for estimating whole-body PCB concentrations.

The data show that total PCB concentrations in fish are correlated with lipid content and that lipid-normalized PCB concentrations in fillet, remaining-carcass, and whole-body samples are approximately equal. Therefore, it is reasonable to expect that whole-body PCB concentrations can be predicted reliably as the product of measured PCB concentrations in fillets, and the ratio of measured whole-body lipid content to fillet lipid content. These assumptions are discussed in more detail below.

PCB molecules display a distinct hydrophobic character and exhibit octanol-water partition coefficients ranging from 10^4 to 10^6 (ATSDR, 1989). Studies of contaminated river systems (e.g. Sloan *et al.*, 1984; MDNR, 1987) show that fish species with high lipid content contain substantially higher total PCB concentrations than relatively lean species. These studies also show that lipid content accounts for much of the intraspecific variations in wet-weight PCB concentrations. Extensive evaluation of the historical data for the Hudson River has allowed investigators to determine that, in aquatic environments of relatively uniform contaminant flux (i.e., river systems with a dominant source of contamination), PCB content of resident fish depends largely upon the quantity of lipid material in individual fish, regardless of species (Armstrong and Sloan, 1980). Statistical analysis of data for over 500 fish taken from the Hudson River and 80 fish taken from the Kalamazoo River show a highly significant PCB-lipid correlation over a range of size classes and species. Information for Lake Allegan carp which was originally presented in a letter to MDNR (BBL, 1993) showed that total PCB levels were highly correlated with lipid content (Figure A-1).

In addition, an analysis of Kalamazoo River fish data collected as part of the 1993 Biota Investigation further demonstrated the correlation between lipid content and total PCB concentration.

Additional analyses were performed to test the hypothesis that lipid-normalized PCB concentrations in fillets and whole-body samples were approximately equal. Data from MDNR (1987) and Niimi and Oliver (1989) are plotted in Figure A-2 and show that these two parameters are highly correlated, and essentially equal, in a variety of species. The MDNR data for analysis of separate specimens were consistent with published data for the analysis of fillet and whole-body PCB concentrations from the same specimen (Figure A-2). Data from Parkerton et al. (1993) also demonstrate the correlation between lipid ratio (fillet to whole-body) and PCB concentration ratio (fillet to whole-body) in a variety of species, further verifying the value of lipid content as a predictor of whole-body PCB concentration from fillet samples (Figure A-3). These data demonstrate not only the intraspecific correlations between PCB concentrations and lipid content, but also the intraspecimen (i.e. fillet vs. whole-body) correlation.

Further analysis of MDNR data and data from published literature indicate excellent agreement between observed whole-body PCB concentrations and those predicted from fillet PCB, fillet lipid, and whole-body lipid (Figure A-4). These data strongly suggest that it is unnecessary to collect and analyze fish for both fillet and whole-body PCB concentrations at all locations, and that it is unnecessary to collect separate specimens for analysis of whole-body and fillet PCB concentrations.

In addition, the data presented in Figures A-2 to A-4 indicate that the PCB/lipid relationship holds for a variety of species and across a range of PCB concentrations. This suggests that data for different species can be addressed using the same lipid-based model.

The Pilot Study was performed with smallmouth bass and carp collected at select locations in the Kalamazoo River to determine how well the simple lipid-based model could predict whole-body PCB concentrations. This model can be expressed as follows:

$$\frac{[\text{PCB-W}]}{\% \text{LIPID-W}} = n \frac{[\text{PCB-F}]}{\% \text{LIPID-F}} \quad (1)$$

$$\text{or: } [\text{PCB-W}] = n * [\text{PCB-F}] * \frac{\% \text{LIPID-W}}{\% \text{LIPID-F}} \quad (2)$$

Where:

[PCB-W] = PCB concentration in whole-body
 [PCB-F] = PCB concentration in fillet
 %LIPID-W = Percent lipids in whole-body (calculated on a mass balance basis using equation 3)
 %LIPID-F = Percent lipids in fillet
 n = constant

As discussed above, available data suggest that $n = 1$, indicating that on a lipid-normalized basis, PCB concentrations in fillets and whole-body are equal. Data also indicate that the lipid ratio can be used to predict whole-body PCB concentrations from measured fillet concentrations as in equation 2.

The Pilot Study was designed to examine how well this model worked when applied to Kalamazoo River carp and smallmouth bass. Specifically, the Pilot Study compared predicted whole-body PCB concentrations to measured whole-body concentrations in the same fish. Measured whole-body concentrations were actually calculated on a mass balance basis using measured PCB concentrations in fillets and remaining-carcass. The mass balance method used to calculate whole-body PCB concentrations is expressed as follows:

$$[\text{PCB-W}] = \frac{[\text{PCB-C}] \cdot \text{WTC} + [\text{PCB-F}] \cdot \text{WTF}}{\text{WTW}} \quad (3)$$

Where:

[PCB-F]	= PCB concentration in fillet sample
[PCB-C]	= PCB concentration in remaining-carcass
[PCB-F]	= PCB concentration in fillet
[PCB-W]	= PCB concentration in whole-body
WTC	= weight of remaining-carcass
WTF	= weight of fillet sample
WTW	= weight of whole-body (measured in field)

As noted in equation (2), the underlying assumption of the model is that if n is equal to 1, then fillet, remaining-carcass, and whole-body PCB concentrations are assumed to be equal when expressed on a lipid-normalized basis. To test this assumption, replicate analyses of fillet and remaining-carcass samples of the same fish were performed as described below.

2. *Methods*

Smallmouth bass and carp were two of the target fish species for the Kalamazoo River Biota Investigation. PCB data from these species were needed to evaluate both human exposure (using edible fillet samples) and ecological exposure (using whole-body samples). As specified in the Biota Sampling Plan (BSP; CDM, 1993), eleven individual smallmouth bass and carp were collected from 11 aquatic biota sampling areas (ABSAs) along the Kalamazoo River and one ABSA on Portage Creek. Of these, 24 fish of each species (six fish from each of four ABSAs) were selected for pilot study analysis. Six fish of each species were selected from the eleven fish of each species that were collected from the following ABSAs:

- ABSA 1 - Kalamazoo River near I-94 upstream from the city of Battle Creek (both species);
- ABSA 5 - Kalamazoo River between Plainwell Dam and Highway 131 bridge in Plainwell (both species);
- ABSA 8 - Kalamazoo River just upstream of Trowbridge Dam (both species);
- ABSA 9 - Lake Allegan (smallmouth bass only);
- ABSA 12 - Portage Creek in area of former Bryant Mill Pond (carp only).

ABSA 1, 5, 8 and 12 were originally selected for the Pilot Study to represent a wide range of PCB concentrations including background (ABSA 1) and the location likely to have the highest concentrations (ABSA 12). When no smallmouth bass were captured at ABSA 12, however, smallmouth bass from ABSA 9 were substituted.

Fish were captured using electrofishing equipment as specified in the BSP. Target fish sizes were 25 cm or greater for smallmouth bass and greater than 45 cm for carp. Fish samples were processed in the field as described in the BSP. Fish were weighed and measured, and a scale sample was taken for subsequent age determination if appropriate. Each fish was wrapped in aluminum foil, placed in a sealed plastic bag, and shipped to the laboratory via overnight courier.

When received by the laboratory, fish were preserved frozen at -20 C until tissue samples were prepared for extraction. Fish samples were filleted according to standard GLEAS procedures (BSP - Appendix A) to obtain fillets (two per fish) consistent with MDNR guidelines for standard edible portions of these species. The fillets were homogenized and a 100 g fillet sample aliquot (200 g QA/QC carp) was retained for constituent analysis. After removal of the two fillets, remaining-carcass samples consisted of all body fluids and offal remaining after filleting, plus the remainder of the fillet homogenate after removal of an appropriate sample aliquot.

Fillet and remaining-carcass samples were analyzed for PCB and percent lipids according to procedures specified in the BSP. These procedures followed USEPA SW-846 Method 8081 (PCB/Pesticides). Samples were soxhlet-extracted according to Method 3540, and extracts were cleaned of interferences using Methods 3630, 3640, and 3665. Percent lipids was determined using mass balance procedures.

3. *Results and Discussion*

Total PCB concentrations and percent lipids for pilot study fish are presented in Table A-1. These data were analyzed to determine how well the lipid-based model predicted whole-body PCB concentrations. Specifically, the analysis tested the model's assumption that lipid-normalized PCB concentrations in fillets and remaining-carcass samples are equal. As such, a plot of lipid-normalized remaining-carcass PCB concentrations versus lipid-normalized fillet PCB concentrations should have a slope of 1. This plot is presented in Figure A-5 and indicate that the model's assumption is appropriate.

Regression analyses of the lipid-normalized data were performed to quantify how well the model fit the data. Regression analysis of pilot study data indicated that the slope of the best fit (least-squares) regression line was not significantly different from 1. The correlation coefficient (r) and coefficient of determination (r^2) for the line with slope ≈ 1 were 0.80 and 0.64, respectively.

These results demonstrate the value of the lipid-based model in predicting whole-body PCB concentrations from fillet PCB concentrations and lipid measurements in fillet and remaining-carcass.

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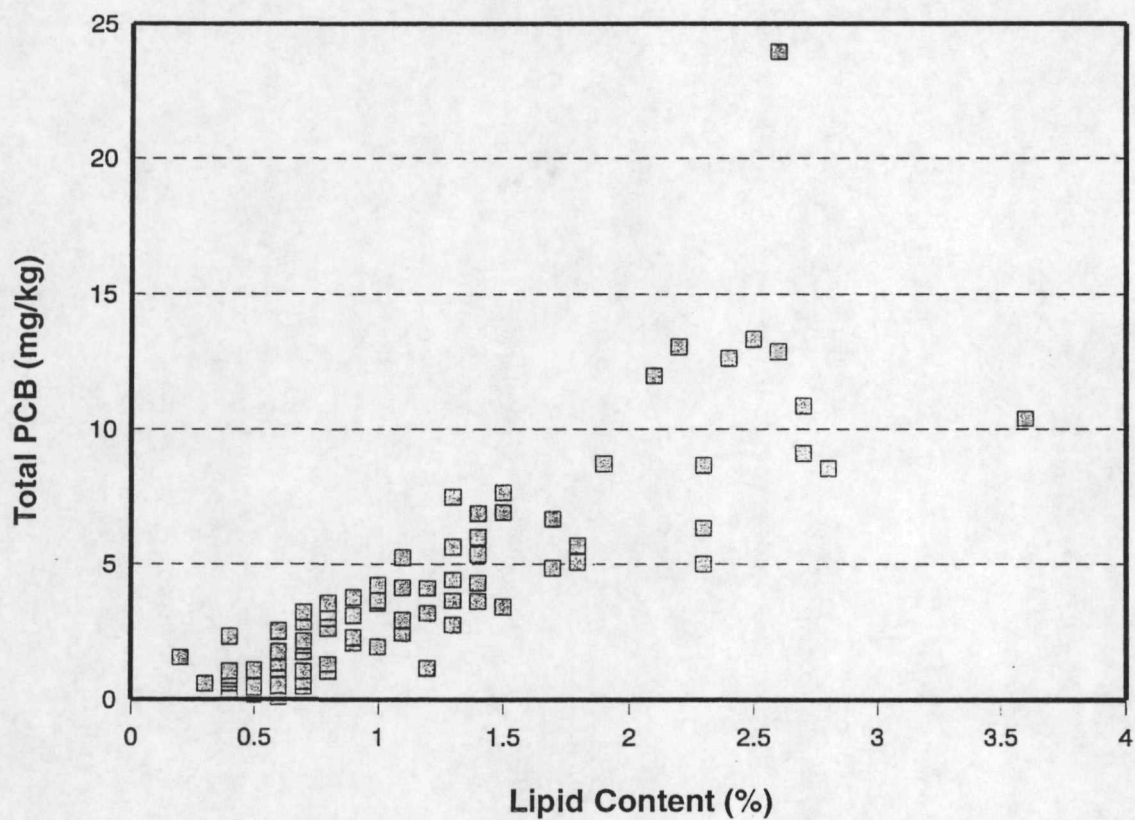
TABLE A-1

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER
SUPERFUND SITEBIOTA INVESTIGATION
PILOT STUDY PCB CONCENTRATIONS

ABSA	Sample Number	Lipids (%)		Total PCB (mg/kg)		Lipid-Normalized PCB (mg/kg-lipid)		Weight (g)	
		Fillet	Rem. Carc.	Fillet	Rem. Carc.	Fillet	Rem. Carc.	Whole-body	Fillet
Small mouth Bass									
1	K40245	0.98	3.2	0.098	0.44	10	14	800	100
1	K40239	0.90	2.3	0.084	0.207	9.3	9.0	1000	100
1	K40242	1.5	4.2	0.093	0.38	6.3	9.0	1000	100
1	K40244	1.3	2.2	0.15	0.27	12	12	740	100
1	K40241	2.3	5.1	0.31	0.87	13	13	900	100
1	K40240	2.3	4.4	0.28	0.58	12	13	1000	100
5	K40353	1.6	2.8	3.9	7.2	250	260	290	100
5	K40354	2.4	3.5	1.7	4.7	70	140	310	100
5	K40370	0.80	2.8	1.5	4.3	190	170	640	100
5	K40351	1.0	4.7	1.4	5.6	140	120	810	100
5	K40352	0.81	3.0	1.3	6.1	220	210	290	100
5	K40369	1.0	1.3	2.3	2.8	220	220	790	100
8	K40305	1.6	3.0	4.2	7.2	260	240	500	100
8	K40310	1.2	4.1	2.2	10	180	250	300	100
8	K40308	1.6	3.6	3.0	7.0	190	190	300	100
8	K40309	0.52	1.8	1.6	9.8	300	530	400	100
8	K40304	1.0	5.8	1.5	13	160	230	500	100
8	K40306	0.36	1.5	1.6	13	430	870	500	100
9	K40133	3.7	7.5	5.7	12	160	160	850	100
9	K40137	2.2	5.4	2.2	5.2	98	97	630	100
9	K40140	1.2	5.9	1.6	5.9	130	100	280	100
9	K40138	1.7	5.7	3.4	9.9	210	180	430	100
9	K40136	2.3	9.2	3.2	13	140	140	600	100
9	K40135	4.3	5.6	5.8	7.1	140	130	680	100
Mean		1.6	4.1	2.0	6.1	150	179	610	100
SD		0.94	1.9	1.7	4.4	110	188	250	0
Carp									
1	K40421	0.81	1.7	0.055	0.13	6.8	7.3	3200	100
1	K40423	1.4	2.4	0.10	0.15	7.2	6.2	3000	100
1	K40422	1.2	2.2	0.090	0.22	7.4	9.6	2800	100
1	K40428	0.35	1.1	0.090	0.43	26	39	1800	100
1	K40430	0.77	1.6	0.055	0.19	7.1	12	2100	100
1	K40427	0.48	0.75	0.058	0.11	13	15	1700	100
5	K40359	2.9	5.9	6.0	13	210	210	3200	100
5	K40381	12	9.5	17	14	150	140	3100	100
5	K40362	7.0	8.5	7.9	8.0	110	94	3100	100
5	K40363	2.6	5.6	2.1	6.7	82	120	2150	100
5	K40364	4.0	6.0	3.0	5.0	76	83	2100	100
5	K40350	1.4	8.7	1.4	7.2	100	83	2100	200
8	K40319	0.66	2.3	4.2	5.7	490	250	2000	100
8	K40327	3.1	4.8	9.1	14	300	300	2800	100
8	K40321	5.7	8.8	9.6	4.3	170	49	1700	100
8	K40318	1.1	1.0	5.7	5.0	540	500	3200	100
8	K40326	1.0	3.1	6.5	9.1	630	300	2900	200
8	K40320	2.2	4.9	2.5	7.0	110	140	1500	100
12	P40404	1.6	4.1	4.7	12	290	290	2100	100
12	P40401	2.2	3.3	2.0	2.4	89	73	1800	100
12	P40400	1.4	2.6	4.3	10	310	390	1900	100
12	P40408	1.3	2.2	1.5	5.3	120	240	1700	100
12	P40406	1.4	2.3	8.8	12	610	520	1600	100
12	P40405	1.7	3.2	3.1	6.9	190	220	1700	100
Mean		2.4	4.0	4.2	6.2	190	170	2300	110
SD		2.5	2.7	4.2	4.7	190	150	150	150

Notes:

Rem. Carc. - Remaining-carass
SD - Standard deviation



Note:

Data obtained from MDNR (1987)
for samples collected in July 1986.



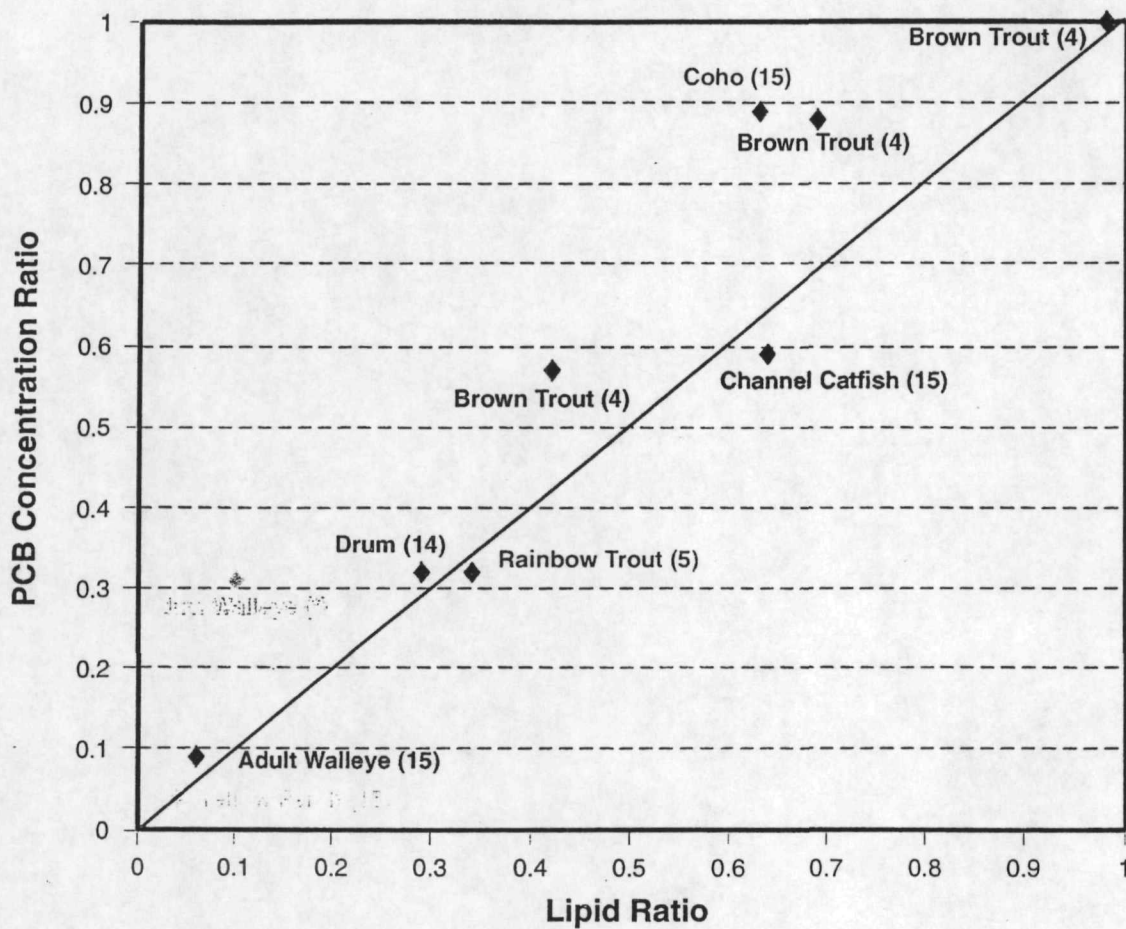
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BIOTA INVESTIGATION

RELATIONSHIP OF TOTAL PCB
CONCENTRATION TO LIPID CONTENT
IN LAKE ALLEGAN CARP

FIGURE
A-1



Notes:

Data obtained from
Parkerton, et.al, 1993.

Sample size in parentheses

* Sample size unknown



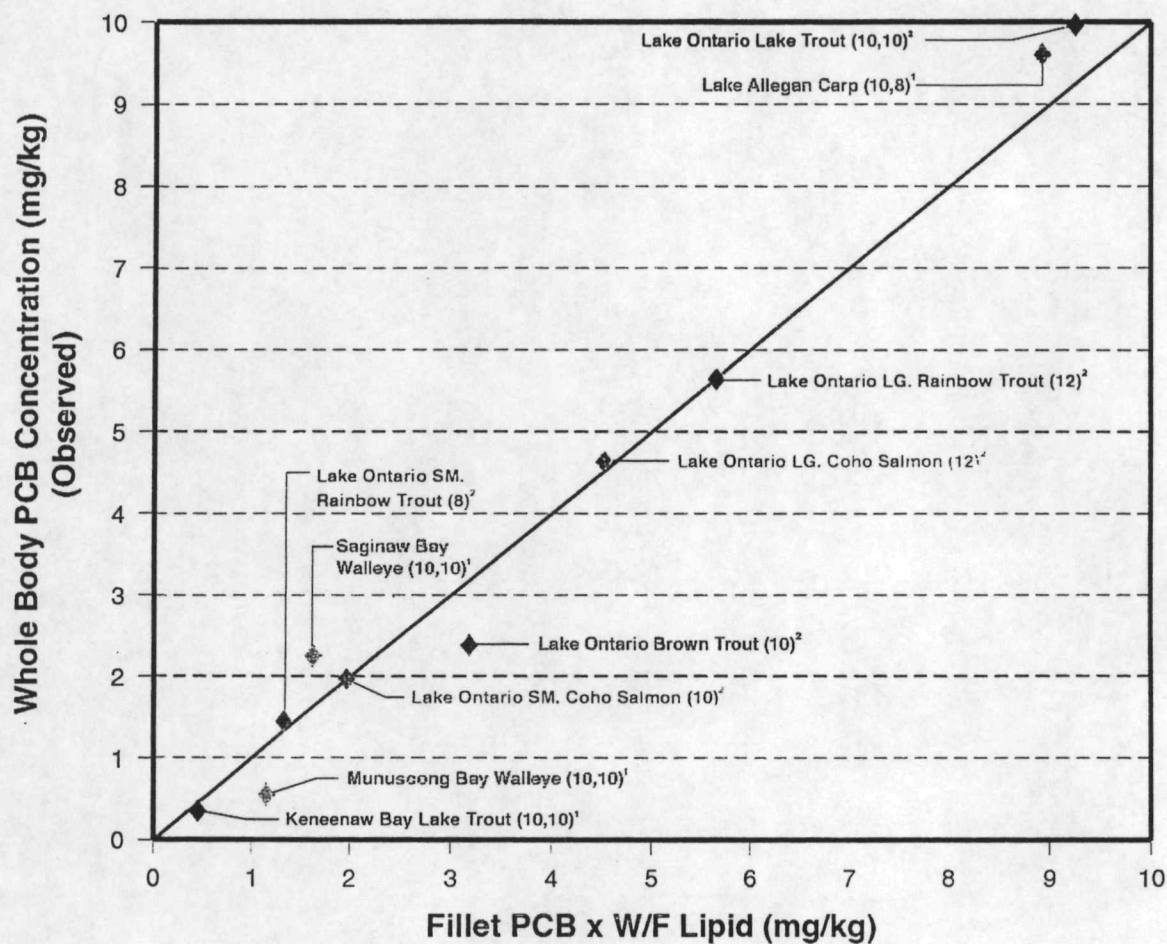
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COMPARISON OF FILLET/WHOLE
BODY RATIOS OF PCB
CONCENTRATION AND LIPID CONTENT

FIGURE
A-3



Example:

Body of Water Number of Samples
 Lake Ontario Lake Trout (10,10)²
 Species of Fish

Notes:

1. Data from MDNR for separate specimens
2. Data from Niimi and Oliver, 1989 for fillet and whole body samples from the same fish.



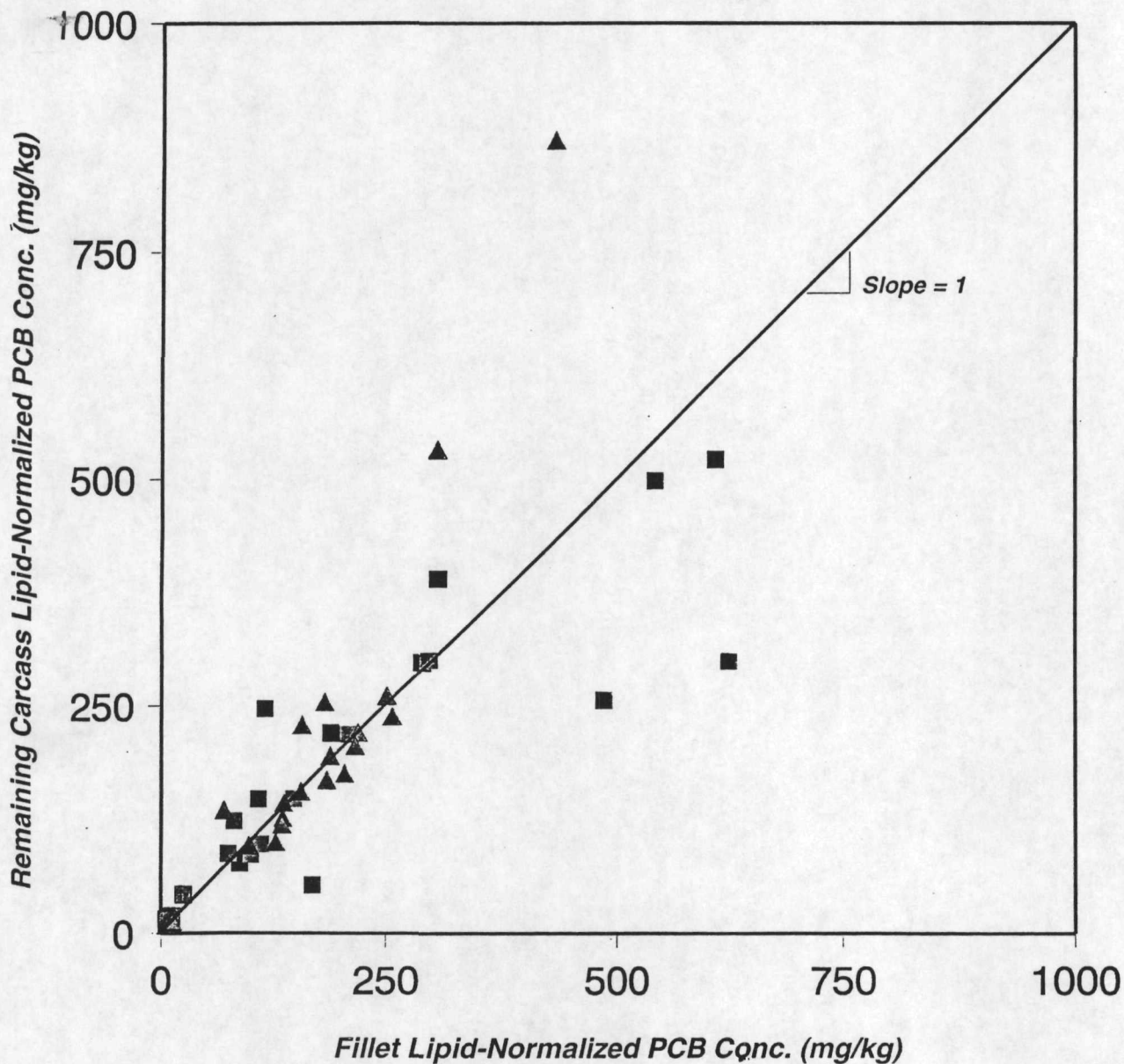
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**ESTIMATION OF WHOLE BODY
 PCB CONCENTRATION FROM
 FILLET PCB AND WHOLE BODY
 LIPID CONCENTRATION**

**FIGURE
 A-4**



Legend

- | | |
|---------------------|-----------------------|
| ■ Carp from ABSA 1 | ▲ SM Bass from ABSA 1 |
| ■ Carp from ABSA 5 | ▲ SM Bass from ABSA 5 |
| ■ Carp from ABSA 8 | ▲ SM Bass from ABSA 8 |
| ■ Carp from ABSA 12 | ▲ SM Bass from ABSA 9 |



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REMAINING CARCASS VERSUS
FILLET LIPID-NORMALIZED
PCB CONCENTRATIONS

FIGURE
A-5